Australian Personal Computer

SPECIAL FEATURE: ARTIFICIAL INTELLIGENCE/ EXPERT SYSTEMS

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OCTOBER 1985 $2.95

AUSTRALIA'S TOP SELLING COMPUTER MAGAZINE

IBM GOES DOWN AGAIN

Exclusive Benchtest of Big Blue's return to the budget micro ring

NOW WITH 80286 & Z80H

Universe

Security and speed Software compatibility, and

Forget conventional networking. Universe provides superior speed and security necessary in multiuser applications. Running the widest range of 8 and 16 bit software, it has the ability to network IBM PCs and workalikes in the fastest multiuser/ networking microcomputer system in the world.

Multiuser – efficiency

A single Universe runs up to 25 workstations, each with any combination of 8 and 16 bit programs. Advanced AED network technology allows expansion to 100's of users.

Multitasking – productivity

Each operator can use any four 8 and 16 bit programs at the same time. Switching screens takes only a single keystroke.

Networking – flexibility

Up to 255 MS-DOS machines. IBM PCs and workalikes can be linked into the Universe system using a high speed DR Net local area network.

IBM PCs and workalikes can run applications written for Concurrent PC DOS, CP/M-86 and PC-DOS, while having access to all the benefits of the network. PC users share files, records, printers and other network resources.

Software – compatibility

Dual processor design, provides access to the world's largest software base via CP/M, MP/M and MS-DOS. With AED's new Concurrent DOS you have the best of all worlds.

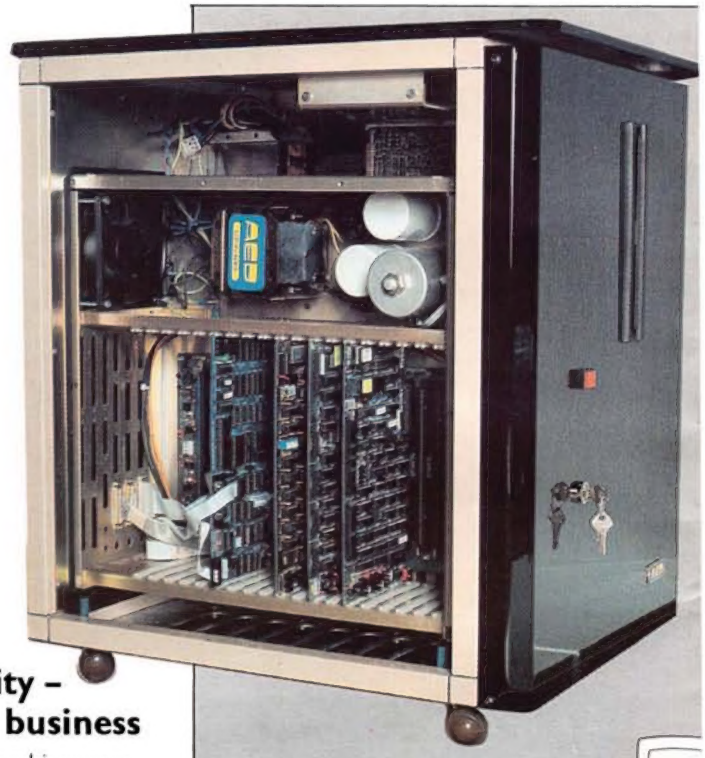
DMA hard discs and the new high-speed 80286/Z80H dual processor CPU furnish performance necessary to handle multiple 8 and 16 bit programs.

Tough
The Universe is built on a strong square tube frame.

Stays Cool
No fancy operating environment needed. Every Universe is tested at 42 degrees C.

Flexible
Universe accepts an extensive range of terminals, printers, modems, even electronic telex.

Expandable
20 slot shielded S100 buss. Obsolescence proof using IEEE 696 S100 cards.



Speed and Security – essential to your business

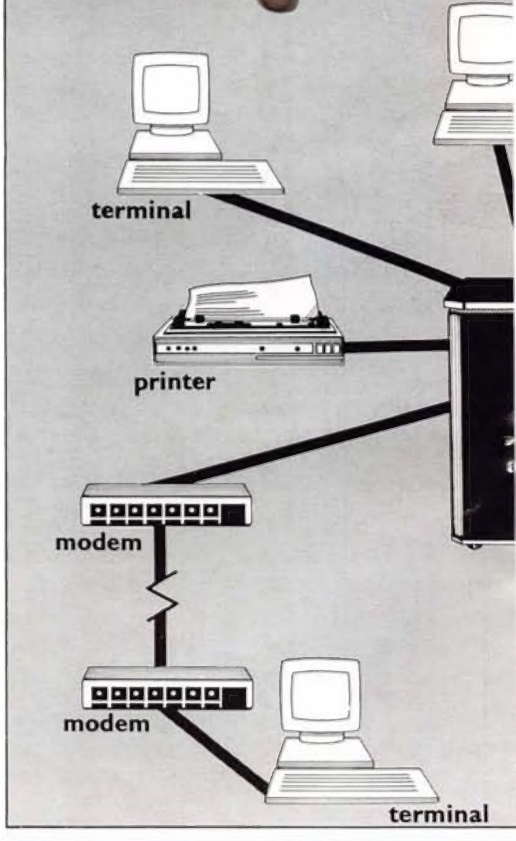
Most networks are slow and insecure. Universe shines here, with full multilevel security enhancements normally found on well engineered minicomputers. Universe is engineered from the ground up to provide facilities essential for the smooth running of a large multiuser system.

Important Security features

Encrypted login passwords. Users are restricted to specific terminals, directory areas, programs and nodes on the network.

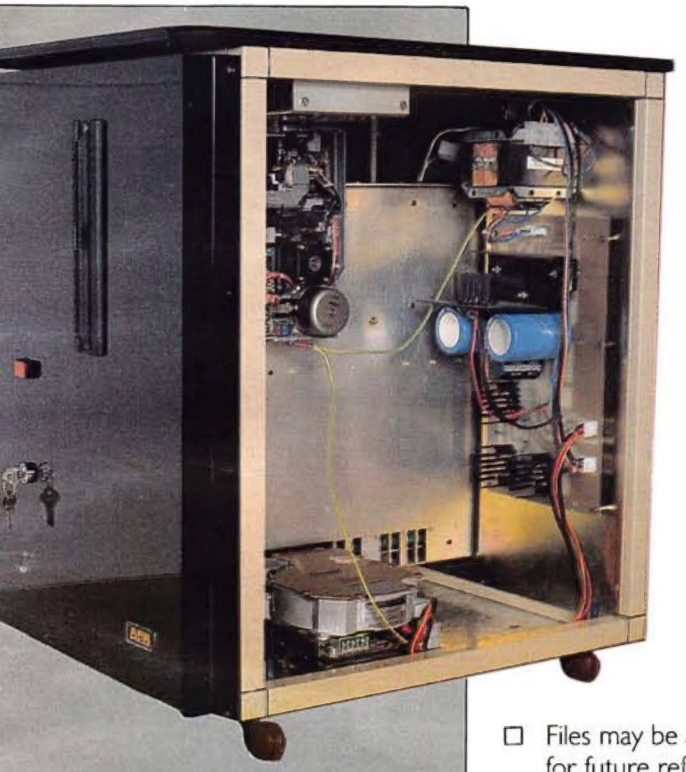
File passwords. File and record lockout and a full password hierarchy. Your System Manager can quickly and easily configure the system so that each terminal only has access to those facilities and data its operator needs. For example:

- ☐ Option to restrict any account to specific programs or workstations



Multiuser

of a minicomputer.
eliability of a supermicro.

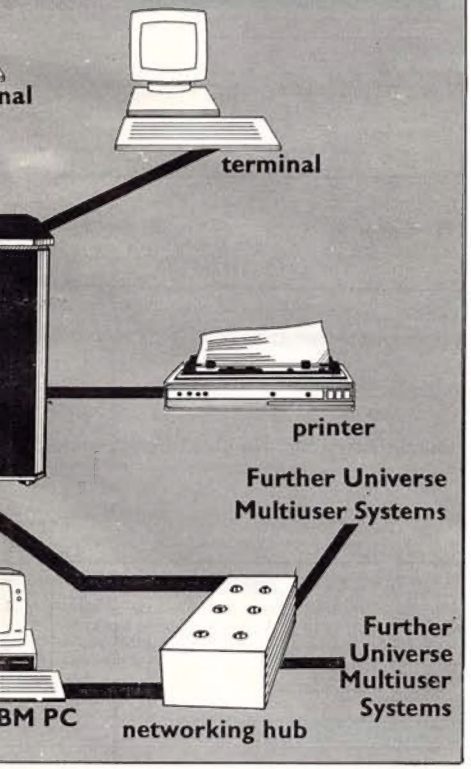


Smart
Powerful file I/O processor makes Universe operation faster, leaving the CPU free of repetitive tasks.

Fast
High speed (8MHz) dual processor design (80286 plus Z80H) with options for 68000, 16032 etc.

Durable
Ebony glass top and acrylic epoxy finish

Capacity
3 Winchesters plus removeable cartridge totalling up to 300 Megabytes total storage.



- ☐ Files may be automatically dated for future reference. Optional timestamping shows both creation and last access.
- ☐ Optional passwords on computers within a loca area network.

Operating features

- ☐ Low cost serial terminals support both 16 bit (CP/M, Concurrent DOS, MP/M-86) and 8-bit (CP/M, MP/M II) software
- ☐ 200 character type-ahead buffer per terminal
- ☐ Fast 'hashed' directory searches
- ☐ A secure electronic mail facility. Optional electronic Telex.
- ☐ A multiuser appointment calendar
- ☐ Optional 8087 maths coprocessor
- ☐ Inter-terminal communication. Electronic mail is here!
- ☐ A programmable keys utility so users can redefine their keyboards
- ☐ Optional telecommunications with remote computers via modem

Full Field Support

We were the first company in Australia to introduce full 12 month on-site maintenance (now extendable to 2 years at time of purchase). All service and engineering support is carried out by AED directly.

Australia wide network

Field service is presently within 24 hours on the east coast and within 48 hours for country areas.

Our network is being aggressively expanded.

Inherent high reliability and modular construction minimize downtime and make service to the most remote locations feasible.

Customer support

Our very first system buyer is still a valued customer. We take special pride in supporting every existing customer and in providing the highest standard of service at every stage. As part of this support, the Universe is continually being refined in reponse to the needs of existing customers and Australian business.

AED

NSW: AED Computers (Sydney). Unit 3, Prospect Industrial Centre, 2 Stoddart Road, Prospect NSW 2149. Ph: (02) 636 7677. Telex: AA 70664

The Computer Factory. 214 Harbord Road, Brookvale 2100. Ph: (02) 938 2522

ACT: AED Computers (Canberra). 217 Northbourne Ave, Canberra 2601 Ph: (062) 47 3403. Telex AA 62898

VIC: AED Computers (Melbourne). 53 Waverley Rd., East Malvern 3145. Ph: (03) 211 5542 Telex AA 30624

WA: Computer Services of WA. 465 Canning Highway, Como 6152. PO Box 22 Como 6152. Ph: (09) 450 5888

APC Contents

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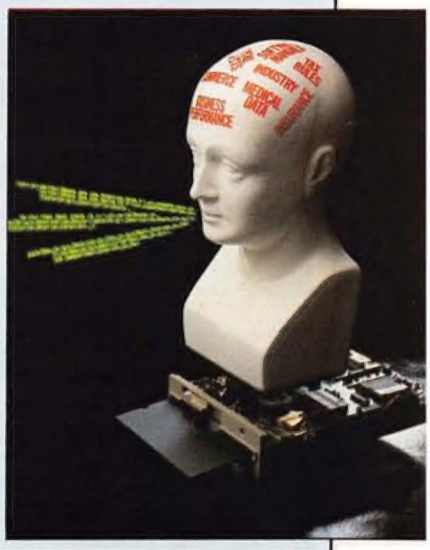

BENCHTESTS & REVIEWS

If your office looks like this - we can help you.

When you're up to your neck in crocodiles, it's too easy to forget that your goal was to drain the swamp. Modern Business is often like that. We get so involved with today's deadlines, we never have a chance to stand back and think.

SuperProject

SuperProject from Sorcim/IUS can help you plan…anything. You just sit at a terminal and describe all the things to be done, by whom, for how long, and in what order.

Each resource has its own calendar and you can see the project in detail or in overview.

SuperProject tells you the cost, the finish date and who's over-committed. All the critical activities are highlighted in red.

SuperCalc3

SuperCalc³ Release 2 from Sorcim/IUS is a classic spreadsheet with some key differences. Precious memory is only used by cells holding significant data. Your model can be as large as 9999 rows by 127 columns. There is no need to change disks to graph results. It's up to 10 times faster.

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All the news that's fit to print from APC's world-wide network of reporters.

Amazing conversion

The arrival of Metacomco as a serious supplier of systems software is starting to produce uneasy reactions at the established companies in this area, Microsoft, and Digital Research. The apparent rivalry between the Amiga and the Atari has had a truly profound effect on the religions of executives at the CP/M company, Digital Research.

The main problem, of course, has been the collapse of the imaginary computer market.

The imaginary computer market was that collection of no-hope American micro makers, who had nothing to offer the world except an imitation of the IBM PC, without the attraction of an IBM guarantee, or even the certainty that it would run IBM software.

These people all submitted estimates of their next five years' turnover to experts.

The experts all added it up, and produced a projection of the micro market based on reports of present sales which were lies, and assumptions of future sales which were simple fantasy. Eagle, Texas, NCR, Sperry, AT&T, and a lot of others who are, some of them, still in the business. Most of them sought credibility, by buying enormous numbers of Digital Research operating systems, and they mostly announced what they thought the contract would be worth, if the machine sold in thousands.

Anyway, it never happened. And after several years of preaching the gospel of "true concurrency" Digital Research has suddenly become a disciple of the alternative approach. "Keep the programs in memory by all means," they say, "but only run one at a time."

The reason for this strange religious conversion is simple: DRI used to sell a thing called Concurrent PC-DOS, which was "true concurrency". It actually kept running more than one program at the same time, and even permitted two programs, under certain conditions, to read the same file, at the same time.

AmigaDos, of course, does this.

But these days, Digital Research has abandoned all hope of making a serious living from Concurrent PC-DOS.

Instead, they are convinced that fame and fortune will be theirs, just as soon as Jack Tramiel starts selling the Atari 520 ST by the thousand. The machine uses GEM DOS, under the pseudonym Tramiel Operating System, or TOS.

GEM DOS is not true concurrency, but "context switching and time slicing."

By contrast, Microsoft always proclaimed the joys of context switching. They suggested that as long as the program was loaded into memory, it didn't matter to the user whether it was running — in fact, what possible program would you want to have running if you couldn't see it?

The answer to that was: if you have Windows, you can see it, after all. And that's why we now have MicroSoft Windows — or we will, just as soon as Microsoft's big customers get things going and package Windows for the users of their machines.

At once, you realise the importance of Jack Tramiel to Digital Research.

Before I get this paper accused of throwing brickbats at Atari, I shall stick my neck out and say that Atari's 520ST is probably going to change the face of computing.

But before it does that, some near-miraculous events have to occur. Tramiel has to raise a considerable amount of capital, to actually build more than 3,600 machines. Dealers have to be found, who are prepared to handle Tramiel's business. And software houses have to be found, who will write software for the ST.

Before Digital Research got involved, these are exactly the sort of things its executives would have dismissed as impossible. Now, however, they make encouraging noises.

The software people are already up and running — or trying to be. They ring me up from time to time with sad (but nonetheless desperate) voices, saying that they have the "C" language, but no <stdio> or standard input-output (without which, it's useless). Or they have a machine, but no display. Or they have software, but the disks don't work. But (they do add) they like it!

Less than 1,000 (I gather around 400) STs had been delivered by press time, all to software writers like this, and all enthusiastic, but frustrated.

The capital, I think, will arrive. Tramiel has always been able to wave the magic wand which generates money for a new idea, and his history is a series of

A 20Mb hard disk for the 512k Macintosh will be available from Apple in October in limited supply. This is only one of three new products from Apple for the Mac: the other two are a 'Switcher' utility allowing several programs to remain in memory at one time and the rapid transition of program control from one to the other; and an upgraded printer, the ImageWriter II.

The 20Mb drive is only 3.5 inches in diameter allowing the unit to sit underneath the main Mac box, as shown above. The disk comes with a hierarchical filing system allowing any number of files and folders to be stored without the need for partitioning.

The ImageWriter II is claimed to have improved text and graphics quality over its predecessor and a print speed of up to 250 characters per second. In the pipeline is an AppleTalk networking card to allow shared printing on a Mac network.

No price details for either of the three prices were available at the time of going to press.

Give your stuc to function in

One day, your students are going to want to use computers in the real world.

In the world of commerce, science or industry.

Some students will be in for a nasty shock.

Because while most students learn on 8 bit machines, most modern software packages need the power of 16 bits.

You need 16 bits, for example, to run leading business software such as the world's most popular, Lotus 1, 2, 3.

Sad to say, most educational computers can't run Lotus. Nor can they run many of the other powerful new software suites used in the workplace today.

In short, a simple 8 bit computer can't provide true to life vocational training.

Yet to learn how to operate in the real world, your students need a computer that's easy to understand and easy to operate.

The Apricot F1e is the first economical 16 bit computer that is easy to learn and easy to operate.

Because it can be operated using "icons" (small pictures that appear on the screen to represent objects or functions), the Apricot F1e is an ideal 'beginners' computer.

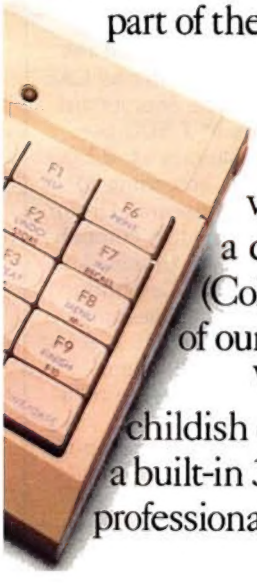
However, most educational computers pale by comparison with the power and sophistication of Apricot.

Most can only deliver a puny 64k of memory capacity compared with the F1e's 256k. And Apricot's power base can be further enhanced to a massive 768k.

The Apricot F1e has a full 92 keys on the board which includes a numeric keypad. (Some educational computers try to get by with just 60 keys.) And as you can see, the keyboard is cordless.

ents the power
he real world.

As is the optional mouse, operating the monitor by infra-red remote control. Your students simply point the mouse to move the cursor to any part of the screen.



Which brings us to the quality of the crisp, high resolution colour image, which at 640 x 256 dots is in a class of its own. (Colour is standard, not as some of our competitors have it, an extra.)

What's more, Apricot is not a childish cassette-based system, but a built-in 315k, 3.5" disk drive of professional business standards.

And as the Apricot operates on the professional MS-DOS system, your students have access to one of the most extensive software libraries around.

The world's most popular business software, for example.

Or innovative new software packages such as the icon-based GEM programme.

And as your students progress, ports for printers and communication interfaces are already built in.

The F1e can also be networked with the other computing heavyweights of the Apricot family.

Which is just as it will be when your students start to apply their computing skills in the workplace.

Only in this case, they'll be thoroughly prepared for it.

Apricot Edusystems are distributed and serviced in Australia by Barson Education.

For the name of your nearest Apricot Edusystems dealer call Barson in Melbourne on (03) 419 3033, Sydney on (02) 888 9444 or Auckland on (09) 50 4049.

Apricot Edusystems.

Dow McIntosh Kelly BAR 090

triumphant launches. Following up the launches with long-term success has been, by comparison, harder for him, and that's one reson why Commodore asked him to go. But despite many bad signs, the machine is good enough to transcend doubts, scepticism, and sheer bloody-mindedness in financial communities, and also in distribution quarters.

It will be launched.

However, the fact of the matter is that Metacomco has written a genuinely multi-tasking operating system for the Amiga, and Digital Research has not managed this trick for the Atari ST.

Thus, I was recently treated to the surreal sight of a senior DRI man solemnly repeating all the warnings that Microsoft has fed me over the years, about multi-tasking. How it's "hard to persuade the user that it can be used", and how "it isn't what the user really needs," and "it takes up a lot of memory without providing equivalent facilities."

The AmigaDOS multitasking system fits in 50k, and uses icons and mouse, as well as command line. I think that if Concurrent DOS could have done this, it would have succeeded.

But Concurrent DOS with GEM on top uses very nearly half the memory capacity of most IBM PCs, and doesn't feed through to the software applications. That is to say, your applications remain as tough to use as ever they were.

On the Atari, however, the applications are built with GEM DOS in mind, and will be friendlier. Also, there is more memory available (it starts out at 512k) and the DOS uses less of it.

Guy Kewney

French Ensemble

The impressive thing about the integrated Macintosh package, Ensemble is not the fact that it comes from French software house, Controle X, but that it runs on the 128k Macintosh.

It may be the only real justification for buying a 128k machine, apart from the possible money saved if you can upgrade it yourself.

The package includes database management, graphics, maths functions, report and form generation, word processing and mail merge. It is obviously intended to appeal to people who might be considering buying Lotus Jazz. Changes made to one element in a "document" have an instant effect on related elements — for example (says the distributor) a graph based on figures in a table will automatically be re-drawn if the table is altered.

What sounds nice, and is worth asking to see if you get a demo, is the "overview icon". This lets you see how a document will look, even if it is bigger than one screenfull. It shows the lines of text as lines, diagrams as blocks, and headlines as horizontal stripes.

The cost looks pretty attractive at around $500. However I haven't had a chance to test this product in everyday use yet, and will pass on further details as I get them. Meanwhile, details are available on (03) 663 6011.

Guy Kewney

Stateside:

Using math to speed data transmission

Ordinary telephone lines will soon be able to carry twice or four times the computer data they now can, says a tiny American startup. Telebyte Technology Inc. in Greenlawn, N.Y., is demonstrating a modem that transmits error-free data at 4,800 baud, and President Joel A. Kramer boasts that the rate will soon rise to 9,600 baud.

Regular phone lines are generally too "noisy" to permit such high-transmission rates without excessive errors, so major computer users lease special data lines — at a huge cost. Says Kramer: "If they buy two of my modems instead, the payback will be 60 days." The secret is a mathematical algorithm patented by Kenneth S. Schneider, Telebyte's vice-president for research. With this formula, a pair of modems check the noise on a line when each call is made, then the receiving modem simply subtracts the noise from the data. Kramer laments that his little company can't possibly supply enough modems to meet projected demand — 500,000 or more — so he plans to license the technology.

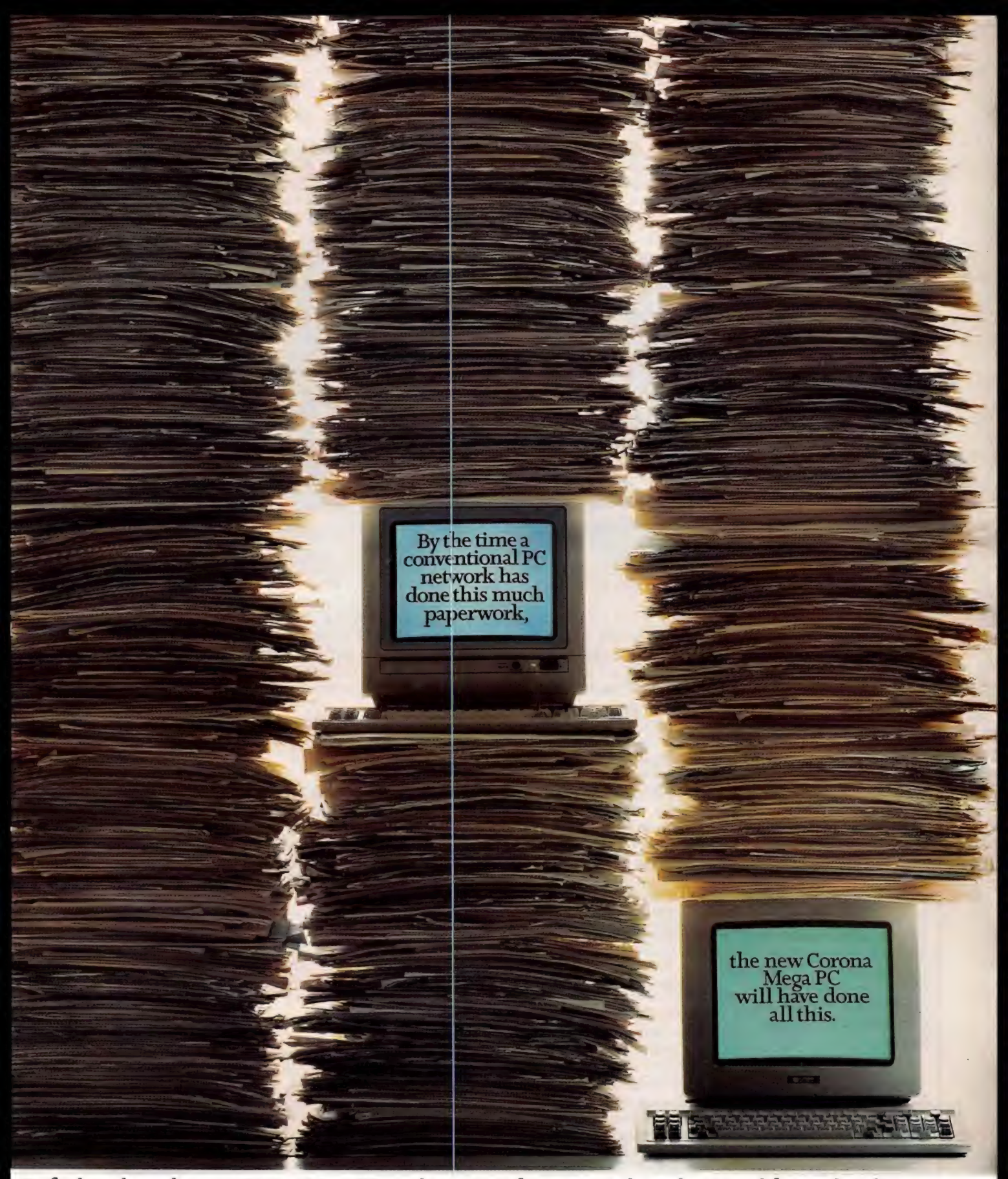
Cheap chip design

Until recently, engineers who wanted computer help in designing integrated circuits or printed-circuit boards had no choice but to spend upward of $A30,000 for a piece of a big, multi-user system. No more. A raft of new software that runs on the IBM PC — and sells for $A5,000 to $A15,000 — has made it possible for almost all chip and board designers to have their own computers. As a result, PCs are rapidly taking over the low end of the computer-aided engineering (CAE) business.

By tapping this market, PCs recently surpassed the installed base of shared CAE computers. The scoreboard now stands at 7,500 personal installations vs. 6,500 big systems, according to Technology Research Group Inc., a Boston USA company that tracks CAE trends. And Daratech Inc., a Cambridge (Mass.) market researcher, predicts that by 1990, 9 out of every 10 CAE video screens will be driven by a PC.

Using a desktop computer does mean a sacrifice in performance, since it

A couple of new IBM PC compatibles have arrived. Sanyo has released its MBC 880 (pictured above); the basic system comes with 256k of RAM and one 320k drive and sells for $2,595 including sales tax. Porchester Computers is selling the Logitec PC with 512k of RAM, two half-height floppy drives and Forth-83 for the rock bottom price of $2,495 including tax. The 10Mb unit comes in at $3,990. Porchester gives the reason for these low prices as economics of scale in the PC's manufacturing, due to a sale of 10,000 Logitec PCs and XTs to China.



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doesn't have the power to handle really complex circuits. But even semiconductor companies are buying the computers as so-called front ends for their big CAE systems. Personal CAD Systems Inc., a Los Gatos (Calif.) vendor, says its top customers are Texas Instruments, General Electric, and IBM. Since the first of the year, P-CAD has caught up with FutureNet Corp., of Canoga Park, Calif., and both are now selling software at a rate of 150 to 200 copies a month.

Research conference short on researchers

Although a spate of new products and a plethora of new research papers turned up at the International Joint Conference on Artificial Intelligence in Los Angeles in late August, there was really nothing that the AI clan hailed as a breakthrough. The gathering did make clear, however, that capitalists are rapidly eclipsing scientists in this field. In fact, no more than half of the people attending were research types.

Until about four years ago, the IJCAI meeting was a chummy affair, attracting only a few hundred devoted researchers. This year so much interest flowed from the executive suite that officials closed registration for the week-long conference after the second day. More than 5,500 people registered, two-thirds more than the 3,300 the year before.

New PC rumours persist

According to a front-page story in *Nikkan Kogyo Shimbun*, a Tokyo newspaper, IBM has just ordered 250,000 3.5 inch, 2Mb disk drives from Mitsubishi Electric Corp. So what's the big deal? Well, as IBM's current PC doesn't use these disks, outsiders speculate that the order is for a much-rumoured new IBM PC that may come out next year. Sources in Tokyo say Big Blue is already shopping in Japan for other parts for its new machine. David Keller, an analyst at James Capel Far East Ltd, says Japanese disk-drive makers, currently suffering from excess capacity, are competing hard for the chance to supply IBM with additional disk drives.

Industry observers in Japan believe that IBM's Mitsubishi order, if it actually were placed, signals the replacement of the 360k, 5¼ inch disk drive as the current industry standard. Mitsubishi refuses to confirm the deal. And IBM has said only that it will not introduce a new PC this year — that is apart from the Japanese JX recently launched in Australia.

Apple has announced a significant new upgrade option in the form of the UniDisk, a 3.5 inch floppy disk drive with 800k capacity. Bundled with the drive, which is due for Australian release in October, is "Mouse Desk" a Macintosh-like program which provides an icon-based environment for manipulating multiple programs and files, using mouse or keyboard control.

ProDos software, but not DOS 3.3 software, can use the UniDisk as a data storage device and, if copyable, can be stored on the new drive. Apple IIc owners should note that a modification will be required to the IIc's disk control firmware in order to work with the UniDisk; this can be done by an Apple dealer at the time of the UniDisk's purchase.

Also new from Apple is a Memory Expansion Card for the Apple II. It's capable of increasing the machine's internal memory to over one megabyte in 128k blocks. The extra memory can be used as a RAM disk by users of either ProDos or Dos 3.3, but DOS 3.3 needs a modification to utilise the Expansion Card for expanded file storage.

Pricing for both the UniDisk and Expansion Card was not available at the time of going to press.

A new chip: this time America beats Japan

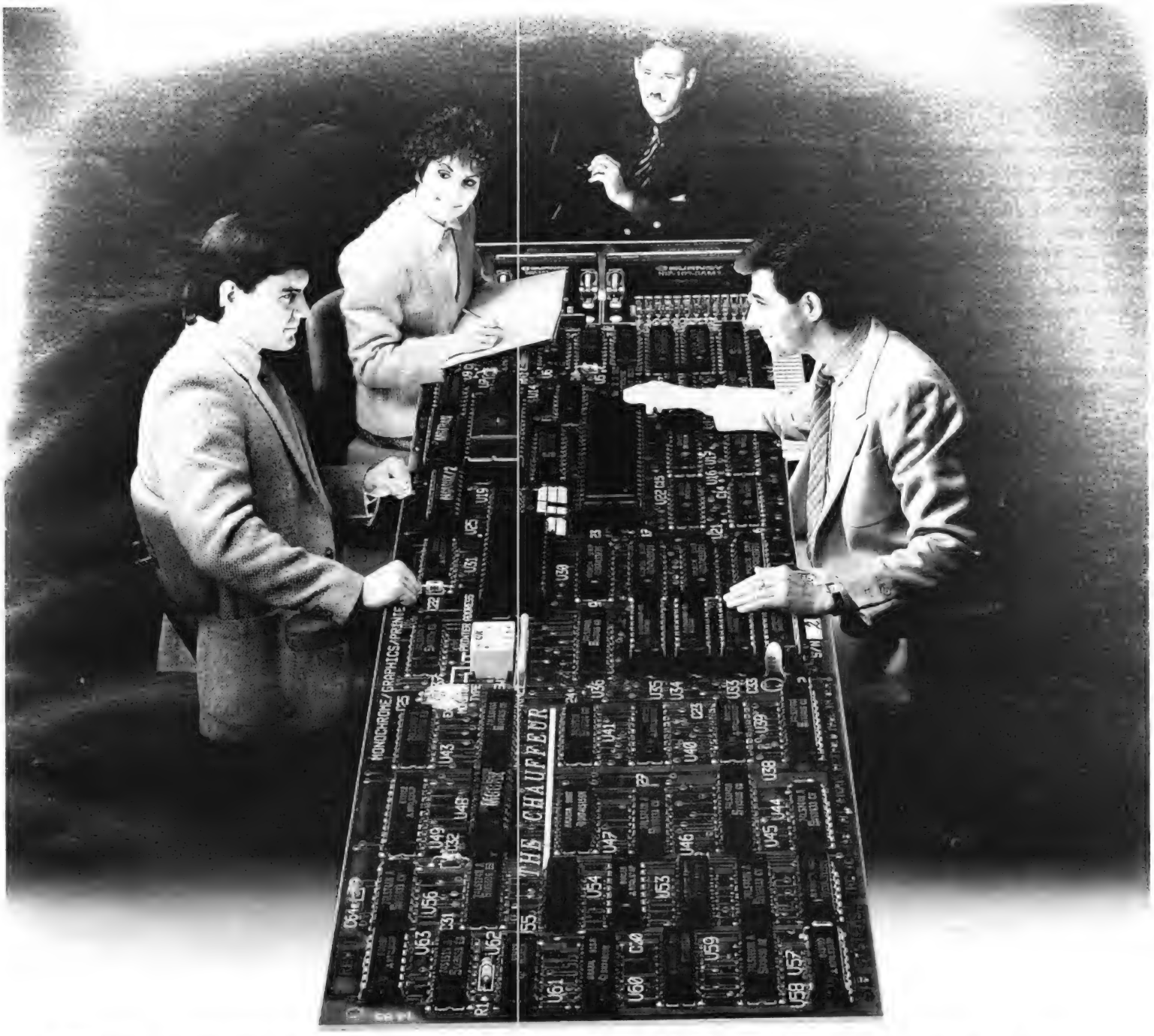
Visic Inc., a US company not yet two years old, claims it has developed a new computer-memory chip offering unparalleled benefits: mind-boggling speed for less than the price of today's fastest RAMs. "It means you can do some neat tricks" to boost the speed of computers, communications systems, and image processors, asserts Visic President Joel A. Karp, who was hired as Intel Corporation's first memory-chip designer in 1966 and designed several of Intel's pioneering RAMs.

Visic's top-of-the-line chip will retrieve any one of more than 64,000 bits of data within 35 nanoseconds (billionths of a second), and the access time for certain segments of the memory is as little as 10 nanoseconds. By comparison, the speediest RAM so far announced is a 25-nanosecond design from Hitachi Ltd. "But no one's ever seen that chip that I know of," snaps Karp. "It's promised for next year. We're shipping now." A few other US startups are also targeting the high-speed end of the RAM market.

Adam Osborne tries playing copycat

Adam Osborne, one of the oldest names in personal computing, is trying to win one of the industry's newest games: selling a low-priced knockoff of Lotus Development Corporation's best-selling 1-2-3 spreadsheet program. As head of Osborne Computer Corporation, the irrepressible entrepreneur pioneered for the first luggable personal computer. Sales zoomed to $100 million in 1982, but mismanagement and heated competition brought heavy losses, and the company sought Chapter 11 protection in 1983.

Now president of Paperback Software Incorporated, Osborne is promoting VP Planner, a $99.95 program that emulates the $495 1-2-3 software. One distinctive feature is its ability to consolidate information from several different spreadsheets in one form. It can also sort through spreadsheet information using Ashton-Tate Companies dBase software. VP Planner goes on sale in September



Expanding your IBM PC may be a board decision

STB provides a solution to the widest variety of board decisions.

STB's Chauffeur is the ultimate monochrome video adaptor board which converts any IBM color graphics display into a format compatible with IBM and ROLAND monochrome monitors. It converts all IBM color graphics on the monochrome screen to a 16 level grey scale. Color graphics displays are shown in full screen format eliminating the need for software modifications, pre-boot software or drivers. A parallel printer port is included as a standard feature.

STB's Graphics Plus II is a universal video adaptor for the IBM Personal Computer range that runs RGB color and IBM monochrome monitors. Graphics Plus II provides 4 and 16 color modes as well as full screen monochrome graphics, using the software drivers provided. Both STB's Chauffeur and Graphics Plus II, provide clear sharp text and graphics on a monochrome screen, free of flickering and fuzzy images. Both include PC Accelerator software, giving printer buffering, high speed disk emulation and hi-resolution drivers for Lotus 1-2-3, Symphony and Framework.

STB's Super Res 400, offers the very best in RGB intricate color graphics for IBM PC, XT and AT. It is designed for use with RGB Monitors such as Roland's CD 240, which have a scan rate of 25 KHz, and 400 line resolution.

STB's Rio Plus II and Rio Grande provide all your additional memory and communications needs.

Contact Roland DG for the name of your nearest dealer who will provide full technical information and a product demonstration.

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ROL C23/SFPS

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Keeping up with you.

BEEMAN MAYRHOFER STOTT/CC422

through bookstore chains and mail order in the US. If successful, it will provide a needed boost for Paperback Software, which has not scored a hit or turned a profit since it raised $US1.35 million in a public offering last January. Says an ever-confident Osborne: "I'm back with this one."

TI Mac driver

Texas Instruments has produced a software driver to replace the Imagewriter driver on the Macintosh for its Omni dot matrix printers. Printing density ranges from 9x9 in 150 characters per second "draft mode" to 32x18 in 35 cps in "letter-quality mode". The software package, TI-start, retails for $180.

PC 2 or not PC 2

Whether or not IBM is telling the complete and unvarnished truth when it says that it never had any plans to launch the PC 2 this year, you can bet that it is being accurate when it now promises that the machine will not be launched.

Plans, inside IBM, are strange things. Until a machine is actually available from the warehouse, it never pays to speak of plans as "plans" — merely as "options".

The options facing IBM until they made this statement (and accused the Press of being "irresponsible" in writing about the PC 2) included a possible 80286 based, desk-top, XT price level machine. They also included a lap-held machine, possibly battery driven.

The lap-held machine is an option on the "plan" level, even now. The PC 2, however, is a serious embarrassment to IBM, because it is still earning money from the PC XT.

In the same way that Apple refused to produce anything that would make the Apple II obsolete until IBM had done it for them, IBM is now addicted to the PC. The AT has been deliberately designed to be too expensive to compete, and the PC 2 has been killed off.

Killed off? How can it be "killed off" if it never existed?

The answer is that the "option" to launch the PC 2 had been worked out in some detail inside IBM, and could have been translated into a "plan" two months ago.

But the option didn't show an improvement on the PC's low profitability (by IBM's standards) and so the corporation sat on it.

The result of the inaugural (and irregular) "Idiotic Press Release Photograph of the Month" competition was a draw between the two pictured above. The first picture was accompanied by the caption "a close-up of the '85 PC award the Commodore 64 won as Australian Home Computer of the Year", bears witness to the PR firm's likely involvement with a land developer and its secretary's likely participation in the odd Friday afternoon indulgence. The second is "Robert Wilson with his Canon Computer" and shows just how clever a Canon Computer can make you — not only can you do your accounts while you exercise, smile at the camera and throw your fist in the air, but you don't even have to be able to see the PC's screen. Isn't technology marvellous?

Lacking margins

On the face of it, you would suppose that something like the Omni-Reader would be quite hard work to operate. You have to line up the little scanning eye and push the head over your paper to read text into the computer.

By comparison, surely, it must be easier to use one of the much more expensive models, which take the whole page and scan it automatically?

Dest Corporation in California makes the Work-Less Station. It has just had to offer a 'margin control enhancement' for its models.

A margin control device makes sure that 'unreadable information' doesn't get into the system. Unreadable information includes such perfectly common printed marks as logos, borders and vertical lines.

The new processor lets you set margins, top and bottom, left and right, to exclude decorative additions.

What's really interesting about the announcement, however, is that the reader costs $495 (retail) in the States and it processes a page in 25 seconds. The company has only just announced results of its first fiscal quarter as a public company, when it earned $5.5 million.

Optical Memory

A good idea of just how excited everybody is getting about compact disk as a data storage medium can be derived from the news that Gary Kildall, writer of CP/M and founder of Digital

The new IBM JX demonstrating its most advanced technological feature.

For under $3,000 it's the lowest priced member of the IBM PC family we have ever marketed. Because the more we learn about making PCs, the more we learn about keeping costs down.

With the JX you'll find all the things you'd expect from IBM.

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IBM

IBM Australia Limited (Inc. in NSW)

Research, has started a CD ROM company of his own.

Of course, things could be better for Digital Research, but the move isn't that simply explained.

More exciting even than CD ROM, I think, is the Optimem project inside 3M company.

Optimem is writeable optical ROM — partly writeable, anyway.

The system uses an incompatible data storage medium from CD, with 12-inch disks, data tracks divided into sectors, and a different sort of laser read mechanism.

But it can create its own data.

The disk used in the Optimem 1000 incorporates "a multilayer film coated on to a plastic pre-grooved substrate."

To write data on these disks, a high power laser pulse (seven to 10 milliwatt) melts an area of this recording layer, creating a hole and exposing a mirrored lower level.

An optical disk of this sort holds a thousand megabytes of data, which can be partly supplied by publishers, partly supplied by yourself, or completely one or the other.

I have to admit that I think that's more use than a CD ROM with the Encyclopaedia Britannica on it, but Jack Tramiel doesn't agree with me.

Guy Kewney

Mac upgrades

One megabyte of RAM in the Macintosh is now possible with an upgrade kit from Firmware Design. Both 128k and 512k machines can be increased to one megabyte.

Supplied with the extra memory is 'Softdisk', a utility which allows part of memory to be configured as a RAM disk, and a modification to the Mac's memory manager to allow applications software which is "designed along Apple guidelines" to use the extra memory. Some programs (most notably Switcher) will not work without a modified set of ROM from Firmware Design being fitted in place of Apple ROMs.

The Firmware Design RAM disk preserves its data through a reset operation. For more details call (047) 39 4267.

An impressively named hard disk, the Hyperdrive, is now available in Australia from Symbiotic Computer Systems. The 10 or 20Mb drive fits within the Macintosh and is claimed to "load and run software nearly twice as fast as any external hard disk drive".

The unit is supplied with 'Manager' which enables users to divide the disk into 'file drawers', each appearing as a separate icon on the Mac's screen and each containing a number of user files; 'Security', a data encryption device, (encrypting all data on the drive); 'Backup', a copying utility to floppy disks; and 'Print Spooler' allowing one file to be printed while working with another.

Prices start at $4,000, including sales tax, for the 10Mb version.

Anyone wanting higher resolution or more colour choices than were previously available from the Polaroid Palette slide-making unit should have a look at an interface between the PC and the Palette unit. Called the VideoShow, and pictured in the bottom right of the photograph above, this unit is normally used to enhance graphics output from a PC up to a resolution of 2,000 x 480 pixels using 1,000 available colours.

What can now be done is to connect the VideoShow unit's output to an enhanced version of Polaroid's Palette unit, resulting in 35 millimetre slide, or prints, of much higher resolution than is possible using a standard PC.

Symphony out of tune

In addition to spreadsheet compatibility with Lotus 1-2-3; increased addressable memory and speed; a revised menu-driven instal program design; new documentation and tutorials; an improved Help feature; and a macro library manager, the latest version of Lotus's Symphony, Version 1.1, also comes with its own bugs.

So bad is the problem that Lotus has recalled all Version 1.1 packages. Apparently the problem only arises when there's a large amount of data in the spreadsheet module: bits and pieces of information, it would appear, just disappear. Embarrassed Lotus programmers are now putting in the appropriate overtime to find a fix, but in the meantime Version 1.1 users are advised to "save their spreadsheet data until a corrected version is made available."

Who's number one?

The proprietors of Multimate International Corporation have recently realized their worth with the sale of the company to Ashton-Tate (most famous for dBase products) for a total consideration of about $28 million.

Last year Multimate had revenues of $30 million, primarily as a result of sales of the Multimate wordprocessor. "This will be the most significant acquisition in the history of the microcomputer software industry," said Ed Esber (Ashton-Tate's president) enthusiastically.

No doubt the acquisition will make Ashton-Tate one of the world's largest microcomputer suppliers, but just how it ranks is the subject of some dispute, even within the Ashton-Tate organisation itself. The statement "upon completion of the Multimate acquisition, Ashton-Tate will become the second largest independent microcomputer applications software company in the world" accompanied the official announcement of the takeover; but the general manager of Ashton-Tate's distributor in Australia, Ron Chernich, disagreed: "This further strengthens Ashton-Tate's position as the world's leading personal computer software supplier" Yes, there are a couple of qualifiers in each statement, however, there would seem to be a basic conflict.

But then, who cares?

END

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How did one computer consistently rise to the top of the class in every state in Australia?

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The main influence had to come from the classrooms of Australia.

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In fact, there are now well over four and a half thousand educational programs written for the BBC.

Much of this software comes from the U.K. where the BBC has been the preferred school computer since 1982.

But an increasing number of curriculum-based software packages have been developed by various educational bodies around Australia.

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YANKEE DOODLES

David Ahl brings all his experience to bear as he predicts the industry's winners and losers. He also hands out the prizes for the 10 worst computers.

Predictions

With a background of 28 years in computers, 11 years of publishing an American magazine called *Creative Computing*, and 18 months writing Yankee Doodles, I hereby present the results of my most recent crystal ball gazing. This is the future that I see for various hardware manufacturers.

IBM will make it big (surprise, surprise). Market domination, huge cash flow, loyal employees, enormous research effort, strong dealer base and an image among corporate buyers of 'you can't lose your job by buying IBM' will contribute to continued domination.

Growth will slow at Compaq as the company becomes larger and less nimble, and as IBM fills up the pipeline. Although frequently approved in corporations as the second source for IBM, the cost advantage over IBM is relatively small. However, quality control is better, at least temporarily, than IBM's.

Texas Instruments will not make it. The TI Pro is one of the least compatible compatibles, and customers are not convinced of its advantages. Even though all the important software is available for the machine, its incompatibility image will prevent it being purchased by volume customers. TI's new approach of aiming at vertical markets is a good idea, and perhaps the only thing that will keep the Pro alive for another year or two.

Nor does the future look bright for other clone-makers — some will die a fast, merciful death and others a long, painful death. In the end, the only difference is how much the investors will lose.

Digital Equipment (DEC), on the other hand, will make it. Despite mediocre personal computers (now withdrawn) and an abysmal PC marketing strategy, the incredible installed base of DEC minis in colleges, engineering, technical, and scientific environments automatically puts DEC on the approved list of vendors whenever new systems are being purchased. Furthermore, the company has a history of wringing more years of life out of its designs than any other minimaker (PDP-8, PDP-11, VAX). The Micro-VAX will be DEC's saviour in the upper end of the micro market.

Hewlett-Packard (HP) will also make it. Like DEC, its installed base of timesharing minis and instrumentation, particularly in technical environments, causes larger corporate buyers to look to HP as they expand their networks. The 150 and the reincarnated version, the Touchscreen, is a loser and the Portable Plus is pricey, but eventually the company will get its product act together.

AT&T will be another success, if only due to its huge cash flow and enormous presence in American industry. The product line shows a total lack of planning and the effects of many competing factions within the company, but as the reorganisation dust settles, a more co-herent product and marketing strategy should emerge.

NCR will fail (in the PC market). It has similar problems to TI, but it is without a dealer base or a coherent marketing strategy. On the other hand, Zenith will succeed as a result of concentrating on specialised vertical markets such as the Air Force and various government branches.

The Data General One is a product looking for a market. Making micro versions of the company's minis is the only sensible strategy for DG; whether or not it chooses to follow it is another matter.

Apple will make it as soon as the company opens its eyes to the existence of a serious home market. The Apple II is number one in schools, and could have been number one in the home market had the company not turned its attention to the business market. Likewise, the Mac is probably an equally serious contender in the home market as the business market.

Commodore may make it if it turns its focus back to marketing. Choosing a production-oriented Dutchman for president was absurd when the company needed leadership in R&D and marketing. If the new marketing crew can re-establish confidence in the dealer network and can convince third-party software vendors to focus on the company's products, there may be hope. Otherwise, not.

Atari will not make it. Jack Tramiel's lean-and-mean approach doesn't build loyalty among employees, dealers, or third-party software vendors. The Atari name — the strongest thing he had going for him — has lost much of its glitter. Trying to move the company into the business market is absurd and will fail miserably.

Tandy will hang in there. While retail computer stores seem to be everywhere, there are still many small US towns in which a Radio Shack is the only computer dealer in town. Even in larger towns, people have confidence that Radio Shack will be around as these trendy computer stores come and go. Tandy will hang on to a small piece of the home, school and small business markets, but a major player, no.

Epson is a tough one. It will continue to dominate the printer market, although IBM will probably take over first place in two or three years. Epson computers have been innovative, sometimes too much so for their own good.

NEC has enormous staying power due to the company's number two spot (behind Fujitsu) in Japan, but marketing in the US ranges from average to horrible. Unless the company gets its marketing act together, it will continue to be an also-ran in the US.

ACT has had a shot at the US market with the Apricots, but it will have to do practically everything right if it is to make it big. If anyone can do it, ACT can, but it won't be easy.

Sinclair products are highly innovative, interesting, and cheesy. In the long-run the lack of quality and utility, and a cavalier approach to customers, will spell doom for the company.

The not-so-magnificent 10

Here, in alphabetical order, with no malice intended, are my choices for the 10 worst computers of all time.

APF PeCos I: with no support at all, APF released a machine that used a JOSS-type language which was totally incomprehensible to any normal person.

Coleco Adam: tape drive unreliable, printer worked only sporadically, software full of bugs and without documentation. Too much new technology and too much hype. I wouldn't give one to a Cabbage Patch doll.

Epson QX-10: nice hard-ware, but the Valdocs software is extremely slow, cumbersome, and frustrating.

Gavilan: the term 'vapourware' is usually applied to software. Gavilan proved it could be applied to hardware as well.

IBM PCjr: an embarrasing *faux pas* that humbled Big Blue with its inexcusable wireless Chiclet keyboard, single disk drive and memory limitations.

Mattel Aquarius: a machine so cheesy, Mattel should have supplied rubber gloves to wear while using it. The company tried to sell a touch-typing software package for it but the keyboard didn't even have a space bar.

Sinclair ZX80: with an unusable keyboard and quirky keyboard Basic, this machine discouraged millions of people from ever buying another computer.

Stonehenge: the hardware was solid — still is, but trying to debug the operating software wiped out the entire race of Druids.

T199/4: with its Chiclet keyboard, not enough keys and non-standard Basic, this machine soured millions of people on computers for-ever.

Video Brain: running APLS (a scaled-down version of APL), the Video Brain required a degree in com-puter science to program it. It did have nice joysticks, though.

END

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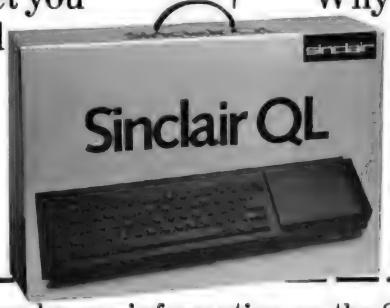

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Access Four	call	call
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Perfect Writer	359.00	299.00
Software not listed: call for best price	call	call

MACINTOSH

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IBM JX

IBM is back into the home computer arena in a big way. The release of the JX signals Big Blue's intention to retain a grip on all segments of the personal computer market. APC scoops the pool on this new computer, and sends Ron Dunn to investigate . . .

The short life of the IBM PCjr, never officially released in Australia, gave rise to much speculation about the future of the world's biggest computer company in the low end of the market. Commentators stated that a company as 'heartless' as IBM simply could not exist in a market devoted to schools and families, a market which companies such as Commodore and Apple dominate.

Well they were wrong. IBM has released what the PCjr should have been. The JX (and don't ask me what JX stands for — my guess is Japanese X-pertise) is a well designed and packaged computer that is suited to home, school and business use.

The JX originated as IBM Japan's entry level system. The Japanese version of the computer has not been an enormous success in that market, dominated as it is by entrenched Japanese companies selling computers often specific to Japanese conditions.

The Japanese JX has a processor architecture supporting dual language characteristics for both Kanji and English characters. An extended keyboard has keytops with both language symbols, and extra function keys for dual language support. The Japanese machine also differs in the attachment of the power cord, and the power supply characteristics.

Early this year, IBM imported a small number of JXs for evaluation, and submission in tender to the Victorian Education Department. Although the company denied all knowledge of the machine in Australia (as is IBM's policy in these circumstances with all computers), the JX was shown to a small number of local non-IBM employees in an attempt to assess its software compatibility and likely market acceptance.

As the Education Department tender progressed, discussion of the computer grew more open. It wasn't until about a month ago, however, that plans for the general release of the computer were discussed in public — the JX, originally proposed as an educational computer only, was officially released for general dealer sales on September 16.

IBM has released what the PCjr should have been. The JX (and don't ask me what JX stands for — my guess is Japanese X-pertise) is a well designed and packaged computer that is suited to home, school and business use.

This is a strategic product for IBM in the small systems market. Having been burned once with the PCjr computer, IBM executives will not be keen to experience another loss of face. This is definitely a computer to watch.

Hardware

The basic JX computer is a conventional, three-box design, consisting of system unit, screen and keyboard. In its base configuration, the computer provides 64k of RAM, two cartridge slots (more on these later), a 30cm colour display, and a compact keyboard.

Options for the computer are an extended 98 key keyboard, 3½in and 5¼in disk drives, joysticks, cassette, light pen memory expansion to 512k, asynchronous communications and additional expansion slots.

The system keyboards are low-profile and of light construction, but have a good, positive feel. Having been spoiled by the standard IBM PC layout, however, I found the more conventional Selectric layout of the JX a little clumsy to use — my fingers kept tripping over the backslash key on their way to the right shift key.

The compact keyboard has ten func-

JX's keyboard is similar to the now defunct PCjr.

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tion keys arranged in two groups of five across the top of the keyboard, along with another key marked FN. This acts in conjunction with other keys to provide extended cursor management. The cursor keys are logically grouped, and clearly marked, and apart from the problem with shift keys I found the keyboard a joy to use. A feature sure to please many critics of earlier PC keyboards is the incorporation of an enlarged Enter key. The Caps Lock key, however, still provides no indication of state, having neither a locked-down position nor an LED indicator light.

The extended keyboard is almost identical to the compact model, but provides a dedicated numeric keypad to the right of the keyboard. This provides the digits 0 to 9, as well as basic mathematical signs, a comma, and its own Enter key.

The keyboards are unusual in providing both infra-red or cabled operation. The infra-red worked well in an office environment, with a distance from the screen of about ten feet. Missed keystrokes — and your aim really has to be bad — will cause a soft beep to sound. Where another infra-red device is operating in the vicinity it is advisable to use the cable, consisting of 0.63m of coiled flex. This can be plugged in at any time, with no effect on any program that's running at the time.

The system unit I tested was equipped with two 3½in disk drives. These seem to break with market tradition by only offering 360k capacity, whereas most other vendors stretch the disk capacity to 720k at least. This was a disappointment. Many small businesses, to whom this computer is ideally suited, need more than 360k of data on a mass storage device, but can not justify a hard disk. As the disk drives are physically incompatible with existing IBM hardware, I can see no reason for having limited disk capacity to this amount. It would appear IBM agrees and has recently released a version of the JX in Japan with 720k drives — no doubt this will be available here in the not too distant future. In the meantime software suppliers will be forced to produce two versions of their software for 3½in disk users: one for the JX and another for the large number of IBM PC compatible lapheld machines which have 720k drives (see feature elsewhere in this issue).

The power switch for the computer is logically placed on the front left of the system unit, and is a positive-feel toggle switch.

Underneath the disk drives are slots for two cartridges. These are completely compatible with the PCjr cartridges, providing a ready supply of software. Cartridges load virtually instantly, and leave all user memory free for data. This will be a boon to users of programs such as Lotus 1-2-3, when cartridge versions become available (and by all accounts, this could be by the time you read this; as IBM has indicated that Imagineering was about to make an announcement the week after this issue went to press). For a start, programs load virtually instantly from cartridge; and secondly programs like 1-2-3 need to store all user data in memory at one time, so programs on cartridges, not requiring any RAM for themselves leave memory free for user data. From the software suppliers side, also, cartridges are difficult to copy. Each cartridge has the capacity for up to 160k of ROM.

Inside the computer is vastly different from the rest of the IBM PC family. The expansion slots are limited and not compatible with IBM PC slots, and expansion cards are much smaller. The system is based on an 8088 processor operating at a standard 4.77 MHz, but no space is provided for an 8087 maths co-processor. The back of the main unit has connections for the following devices: parallel printer, RGB colour display, keyboard, two joysticks, external speaker, cassette recorder and light pen.

Jam packed with device ports.

The disk models have a disk card capable of driving three disks. Three dedicated expansion slots are available within the computer, of which two are used in expanding user memory: one takes a 64k card and the other either a 128k, 256k or 384k card, giving a total of 512k maximum RAM including the standard 64k on the motherboard. The additional slot may be used for the installation of AS232 serial card. If the cluster adaptor card is installed, the computer may only be upgraded to 128k of memory, unless the expansion unit is installed, as the slot which takes the high capacity RAM card is the only one able to accept the cluster card.

The expansion unit can house a 5¼in disk drive for data interchange with the rest of the IBM PC family, as well as another four expansion cards. These are currently restricted to the cards already mentioned, but I would not be surprised to see a hard disk available for this unit within a short period of time. A 10Mb drive is already available in Japan, as are a number of 'third party' cards for the expansion unit, which I'd be surprised not to see here by early next year The JX expansion unit will not accept standard PC expansion cards.

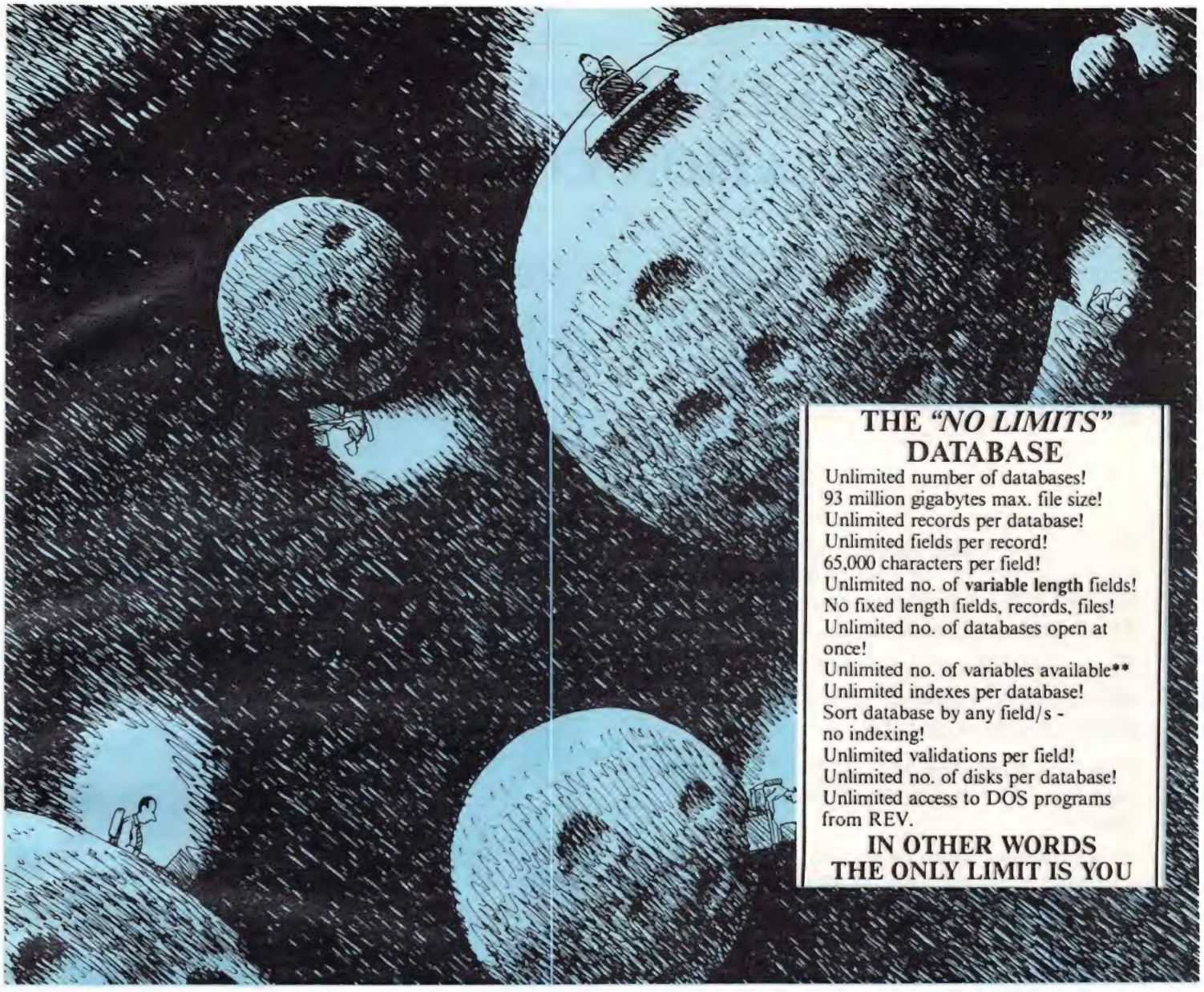
The expansion unit contains the ability to install a 5¼in disk drive for data interchange with the rest of the IBM PC family, as well as another four expansion cards.

The colour display supplied with the system provides an 80 by 25 screen matrix, consistent with that of other PCs. The monitor has a dot pitch of 0.41mm, and is disappointingly fuzzy — those used to IBM's old Colour Graphics display should feel right at home. Graphics may be displayed in four colours at 640x200 pixels, or in 16 colours at 320x200. The character set is a 7x7 font in an 8x8 box.

Also incorporated in the system is an eight-octave triple chord sound generator, connected to a speaker in the display unit. External speakers may be connected if desired.

Software

The JX uses version 2.1 of DOS, and



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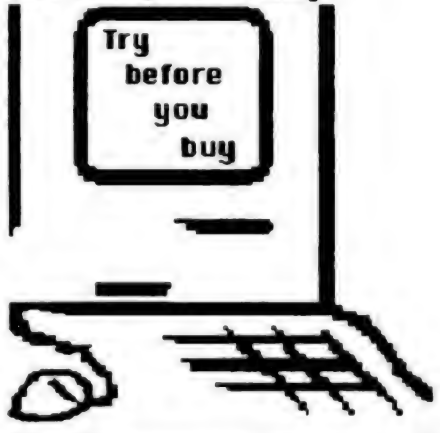

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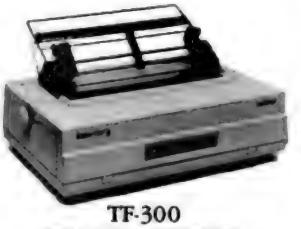

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functions exactly the same as on any other PC. When the machine is switched on, an IBM logo is displayed as system testing is performed, then DOS is loaded from disk, or Basic brought up from ROM if no disk is detected. It's the same Basic found in the PCjr (Advanced Basic), in fact, when loaded, it displays "The IBM PCjr BASIC". The language is standard and does its job well, albeit a little more slowly than Basic loaded from disk.

Memory based operations are exactly the same as for any other 8088 based IBM PC. The *APC* benchmarks ran much the same on the JX, PC, PC-XT, Portable PC and 3270-PC — not exactly the stuff rivetting reviews are made of.

Disk operations were considerably slower than on other computers. The disk drives seem slow to activate, and shut down when waiting for display or printer resources in a much shorter time. This means that a directory listing, for example, will frequently pause to allow the disk drive to restart. A 5¼in disk drive, which was procured along with an expansion unit just as I concluded this test, was considerably faster but was noisy and sounded cheap.

Software supplied with the computer for evaluation included Personal Editor, WordStar, Lotus 1-2-3, Open Access, PC Storyboard, and many other games and utilities. All ran without a problem. I also managed to convert a Turbo Pascal system to the JX and, although making use of BIOS programming, the system ran just fine. I would expect no problems with software that can live within a PC BIOS environment. A potential conflict, however, would be software using disk schemes for copy protection.

All software released for the PCjr will run on the JX, including all cartridge programs. As only the colour screen is available, programs will be expected to live in a colour based environment.

An interesting feature provided as standard with disk-based versions of the JX is a RAM disk utility. The size of the "electronic disk" can be user selected from 10k up to a maximum 512k; it makes file reading and writing almost instantaneous from/to this 'drive', but care must be taken to save all wanted files to a floppy disk before powering down.

No software is bundled in with the machine other than PC-DOS 2.1, two versions of Basic on disk and one in RAM, and usual DOS utilities plus the RAM disk facility and a few Basic demonstrations.

IBM claims to already have over one hundred software titles available on its 3½in disk format and a further twenty or so to be available by early October. There's no doubt software publishers will be scrambling to convert their software over to 3½in format for the JX, or produce cartridge versions of their programs.

WordStar has already been announced for the JX; Lotus 1-2-3 as mentioned earlier, is on the way and dBase III is not much further behind.

There's no doubt that there will not be a shortage of software for this machine, despite the awkward disk format, such is the power of the name IBM. And when IBM releases the 720k drive machine worldwide (some say 'if', but I feel it inconceivable that IBM would restrict the 720k JX to Japan as it is doing now) the question of software availability will be a thing of the past.

Documentation

'Copious' is the word that springs to mind when asked to describe the accompanying literature. Manuals supplied were titled "Guide to Operations", "Technical Reference Manual", "JX PC-DOS 2.1 Technical Reference", "JX PC-DOS Quick Guide", "JX PC-DOS User's Guide", "JX PC-DOS Reference" and "Basic". With the exception of some mediocre proofing *("The next time you start from this DOS diskette the expanded JX mamory will be available...")* the manuals were excellently produced and thorough. Indices were in abundance and the start-up guide was a big improvement over previous IBM efforts.

My only criticism is that there are too many manuals. It's difficult to know where to start with so many reference, user, technical (and multiples of these) manuals. This is not a serious problem though; and no doubt familiarity would help.

Pricing

The JX has been released in three basic configurations. Each includes a colour monitor, a parallel printer port, cassette, audio, lightpen and joystick interfaces as common items.

The base model of the system provides 64k of RAM and no disk drives. This configuration will sell for $2,115.

The intermediate configuration (JX2) increases memory capacity to 128k, and adds one disk drive. This model sells for $2,861.

The high-end configuration sells for $3,365, and provides two disk drives, with increased memory capacity to 256k.

Additional memory from the basic 64k is priced at 64k $172, 128k $345, 256k $419 and 384k $558 (the latter two boards come with a battery backed clock/timer). The expansion unit retails for $268; four expansion slots cost an additional $167; and the 5¼in drive sells for $596. The RS232 board, including a cable retails for $166.

Conclusion

Aside from some initial disappointment with disk capacity and screen resolution, I found this an excellent computer. In fact, the JX is so good I am considering buying one to network into my existing setup as an additional development computer. It provides an affordable entry into the world of IBM computing, with the ability to grow with a user's own development.

Although prices may be a little high for some home purchasers, the days of a $99 toy being sold as a home computer should come to an end — to get quality, you must pay. And quality is what this computer is all about.

The home user will find it well supported, and with a wealth of available software. Business users will find it suited to small business management and accounting operation, with the ability to grow if required. Large corporations will use the JX with success as an executive familiarization tool, or as a stand-alone departmental workhorse. In short, it is a widely useful computer. END

Technical specifications

Processor:	Intel 8088 operating at 4.77 MHz
ROM:	1 Megabit
RAM:	64k-512k
Mass storage:	Cassette ROM cartridges 3½ disk, 5¼ disk
Keyboards:	2 types.
I/O:	Serial parallel cassette light pen video audio
DOS:	PC DOS Version 2.10
Bundled software:	None.

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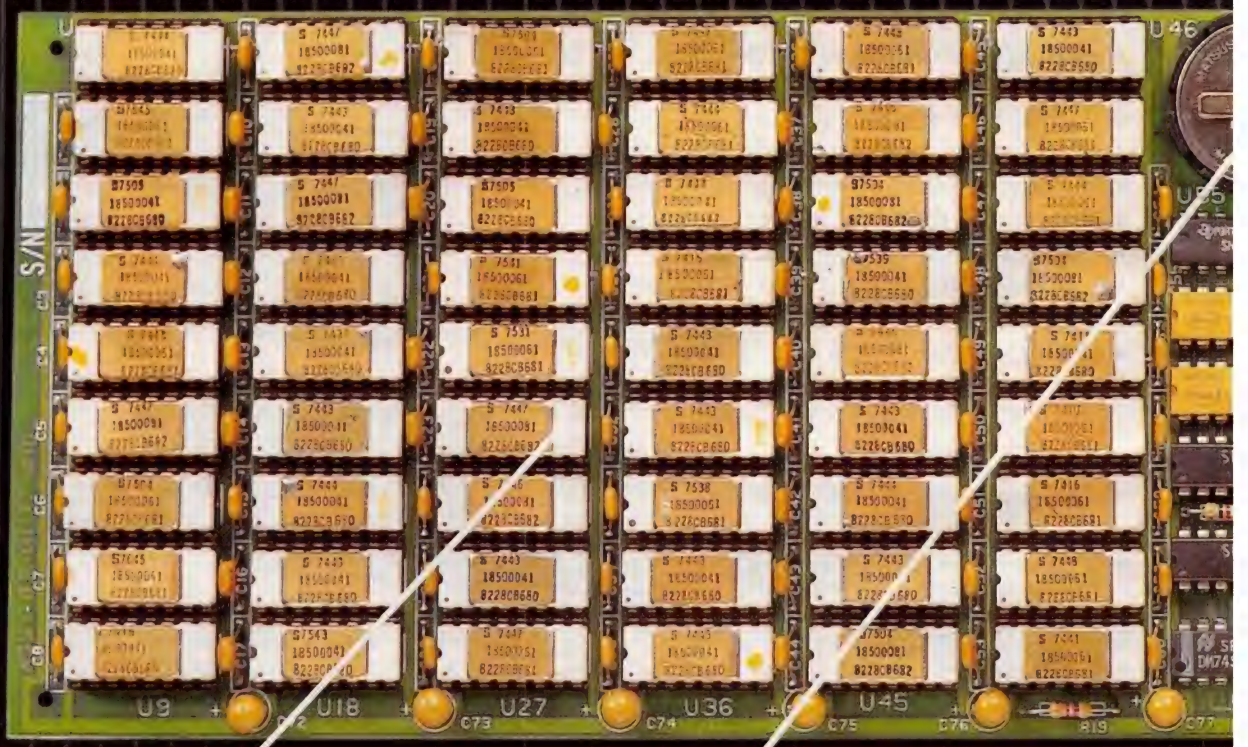

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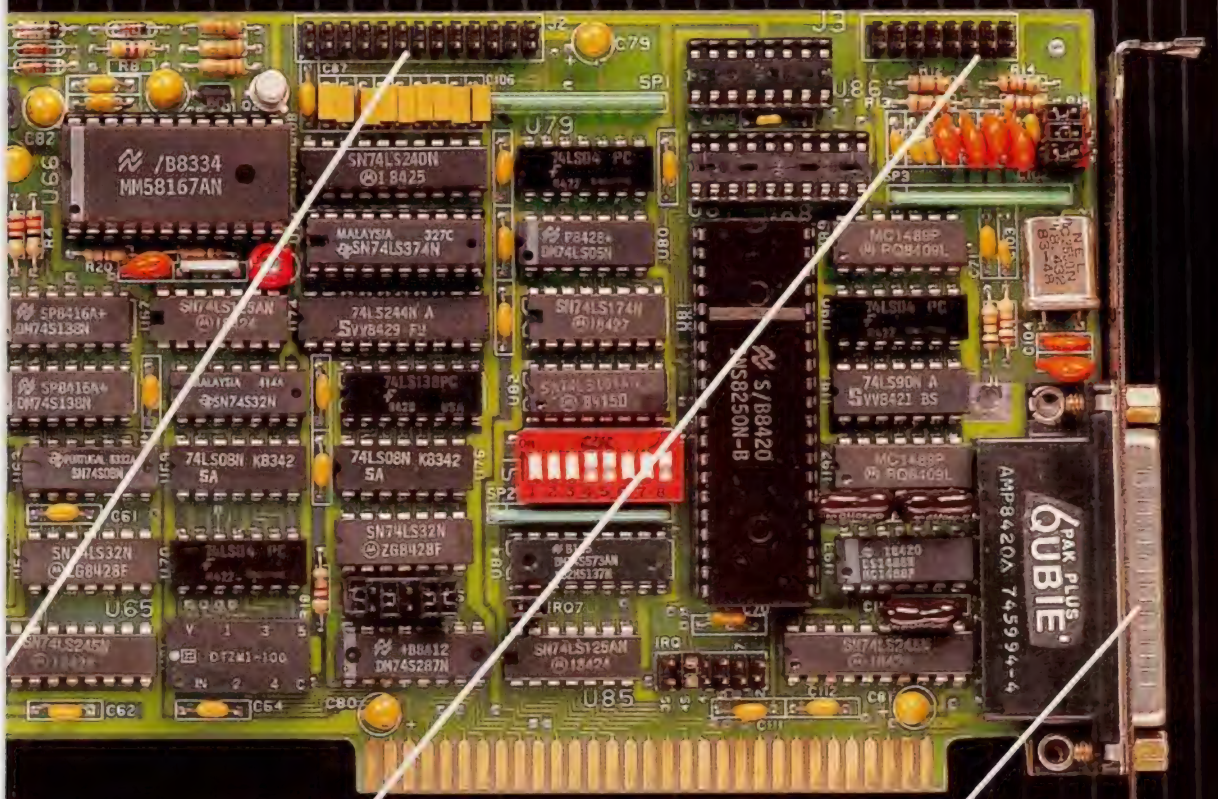

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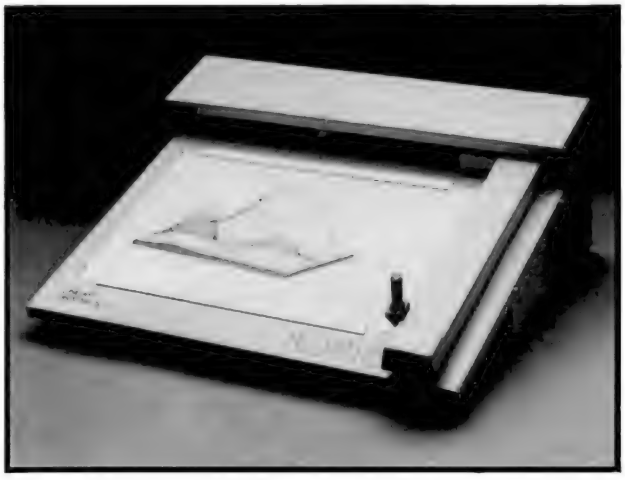

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Amstrad CPC6128

A micro with 128k of RAM, a monochrome monitor, built-in disk drive, CP/M3, DR Logo and priced at $800 sounds like a formidable entry into the marketplace. — Peter Bright looks at the Amstrad CPC6128.

First the bad news: anyone who bought an Amstrad CPC664 is in for a nasty shock. Now the good news: Amstrad now has *the* machine for anyone who wants 128k of RAM, a built-in disk drive, full CP/M and a colour monitor for around $1,000 (exact prices were not known at the time of going to press, but amounts quoted in this article can be taken as an accurate guide).

Hardware

The 6128 looks quite different from Amstrad's previous machines. Even though the new machine has a disk drive built in, it is significantly narrower than either the 464 or the 664. The 3in disk drive is at the far right-hand side of the unit, and it is a much neater job than the 664 — the casing is only marginally higher than the height of the disk drive.

The back of the machine differs from previous Amstrads due to this system being originally designed for the US market, therefore the connections must conform to FCC (Federal Communications Commission) regulations.

From left to right along the back of the machine there are connectors for a second disk drive, a monitor, 5-volt and 12-volt supplies, an expansion socket and a printer socket. Along the side are a DIN socket for a tape recorder, a joystick socket and a sound output socket. The disk drive, expansion and printer interfaces are all edge connectors onto the main PCB.

Amstrad is hoping that the third-party bolt-on goodies brigade will take to this machine with more enthusiasm than they took to the 464 or the 664. The company will be selling a plug-in RS232 card with built in Viewdata capability to make communications easier. It is also hoping that third-party manufacturers might like to provide external hard disks, 5¼in disk drives, and so on, in order to make the machine into an even more powerful CP/M system.

Inside, the 6128 is basically a modified 464. The processor is still the same Z80 and the Basic ROM remains unchanged, with extra Basic commands being loaded from disk; this should keep the new machine largely compatible with software written for the 464. The major change is the extra bank of 64k of RAM, bringing the total up to 128k. Methods of accessing the extra 64k vary according to whether you are using Basic or CP/M.

Due to the 6128 being more narrow than the 464 or the 664, the keyboard has been totally redesigned. Whereas the 464 has a fairly standard qwerty typewriter area with separate cursor keys and numeric keypad, all the keys on the 6128 are bunched together in one block.

SuperCalc on the CPC6128

The layout of the qwerty typing section has also been altered — there are now very large CONTROL and ENTER keys where you would expect to find the SHIFT keys. I found this layout annoying for a while, but no doubt users would get used to it.

An added bonus is that a keyboard chart is printed on the top of the disk drive housing, showing how the keys are numbered. This can be very useful, as when you are running CP/M on the machine, the keyboard is 'soft'. You can redefine any key apart from the CONTROL key from CP/M, which can be useful for setting up cursor keys and quick functions for specific CP/M programs. Different sets of keyboard definitions can be stored on disk and loaded via a keyboard utility when you run the application.

The display on the 6128 is identical to the 464 or 664. There is the option of using either Amstrad's own colour monitor or green-screen monochrome monitor. The display quality is fine for games, although 80-column displays in CP/M can be hard to read unless you choose the right colour combination. Possibly a better combination for serious users is to buy the monochrome display giving clearer 80-column text, and a colour TV adaptor for games.

Software

Expanding memory on processors that usually address 64k can cause problems, especially concerning the way in which Basic sees the extra memory. The best expansion I've heard of was a now defunct British machine, the Enterprise 128 (it never made it to our shores), which makes practically all the extra memory available for use as you require, and the worst is probably the Atari 130XE, which has exactly the same amount of memory available for a Basic program as the old 48k and 64k Ataris plus some obscure POKEs to bring the extra memory into play.

Amstrad's approach lies somewhere between the two: no extra memory exists for the Basic program, but extra commands have been added which allow you to use the memory for up to four screen displays, or alternatively as a RAM data file. Adding extra commands to Basic prompts an additional problem — compatibility. The extra commands on the 6128 are stored on disk so the Basic ROM is exactly the same as that in the 664, giving 100 per cent compatibility with 664 software and 99.5 per cent compatibility with the 464.

To add the extra commands, load a file from the system disk and run it. To use the extra 64k as an area to store screens from Basic, the memory is treated as four 16k chunks, each capable of holding one screen. These blocks can then be swapped with block one of the original memory (the screen display area) causing a quick change of display. Obvious uses for this include animation, and quick screen changes in multi-screen arcade and adventure games.

Two commands, :SCREENCOPY and :SCREENSWAP, manipulate screens. :SCREENCOPY copies the information making up one screen into any one of the alternative 16k screen blocks; :SCREENSWAP exchanges the contents of one block with another. To bring a screen onto the display, you would :SCREENSWAP it into block one.

For more serious Basic applications, the commands :BANKOPEN, :BANKWRITE, :BANKREAD and :BANKFIND are important. Using these commands, the extra 64k is treated as a data file. :BANKOPEN sets the record length and initialises the current record number. :BANKWRITE lets you write data to the file, and :BANKREAD retrieves it fromthe file. Optional parameters specify which record to write to, and return values informing you of the success of the operation. :BANKFIND lets you search through the RAM for a particular data item, and returns the record number where the data is stored or a negative number informing you that no match was found. These bank commands provide a fairly sophisticated and very quick way to manipulate data in database-like applications.

One of the selling points of the disk-based Amstrad machines has always been that they can run CP/M, so can theoretically access a wide range of professional 8-bit business software.

Unfortunately, life is never as straightforward as it seems. Due to limitations in the design of the 464 and the 664, the full 64k of RAM was never available to CP/M programs. This meant that many popular CP/M programs such as WordStar wouldn't run in the standard form on these machines.

All that has changed on the 6128. In order to take advantage of the full 128k of RAM in the machine, the Amstrad 6128 runs CP/M version 3 (or CP/M Plus) instead of CP/M2.2, which is used by the 464 and 664 disk machines.

CP/M version 3 was released just at the time when 16-bit machines were taking over from 8-bit machines in the business market. Consequently, it never had as much exposure as its more popular, but inferior, predecessor.

One of the main advantages of CP/M3 is that it can run on bank-switched machines such as the 6128, and can therefore take advantage of the extra memory. It is also upgraded internally, offering features such as naming of disks, date stamping of files, password protection, and the use of hashing algorithms to speed up disk access.

The implementation of CP/M3 on the Amstrad is very nice indeed. As far as CP/M is concerned, it is divided into three banks which are further subdivided into eight 16k chunks. Bank 0 contains the BDOS and BIOS routines; Bank 1 is the Transient Program Area (TPA); and Bank 2 contains the Console Command Processor (CCP) plus various buffers and hash tables. The TPA is allocated four 16k blocks, one of which is shared with the other two banks so the usual maximum TPA is about 61k. This is quite sufficient for most common CP/M programs and is a vast improvement over the situation on the 464 and the 664.

The majority of 8-bit CP/M programs should now run on the Amstrad. I tried popular applications such as WordStar, SuperCalc 2 and Multiplan, and they all worked well.

One of the great advantages of having all this memory is that the BIOS, BDOS and CCP routines only have to be loaded off disk once when you boot the system. Thereafter they sit quite happily in RAM until you reset the machine, making it much easier to swap disks without having to worry about the correct system-files being available. CP/M3 doesn't require you to Control C the drive every time you change a disk — you just put it in and CP/M will read it.

Installing 6128 applications programs should be straightforward. Amstrad has arranged the system so that sitting between the program and the physical screen is a DEC VT52 terminal emulator: when you install your program, you use VT52 control codes.

Another advantage of CP/M version 3 is that it handles disk and I/O errors much more elegantly than CP/M version 2.2. When you get a disk error, you generally receive a 'retry, ignore or abort?' message rather than one of the dreaded 'BDOS error on A' error messages. The only trouble with this on the 6128 is that the CP/M messages scroll along the bottom of the screen quite quickly, and it took me two or three rotations to catch what the message actually said.

Although you can add a second disk drive to the system, I suspect that most people will make do, at least in the beginning, with just the internal drive. For this reason, Amstrad has set up CP/M so that two logical drives (A and B) are mapped onto the single physical disk drive. Consequently, disk and file copies can be done from A to B — you can pretend that

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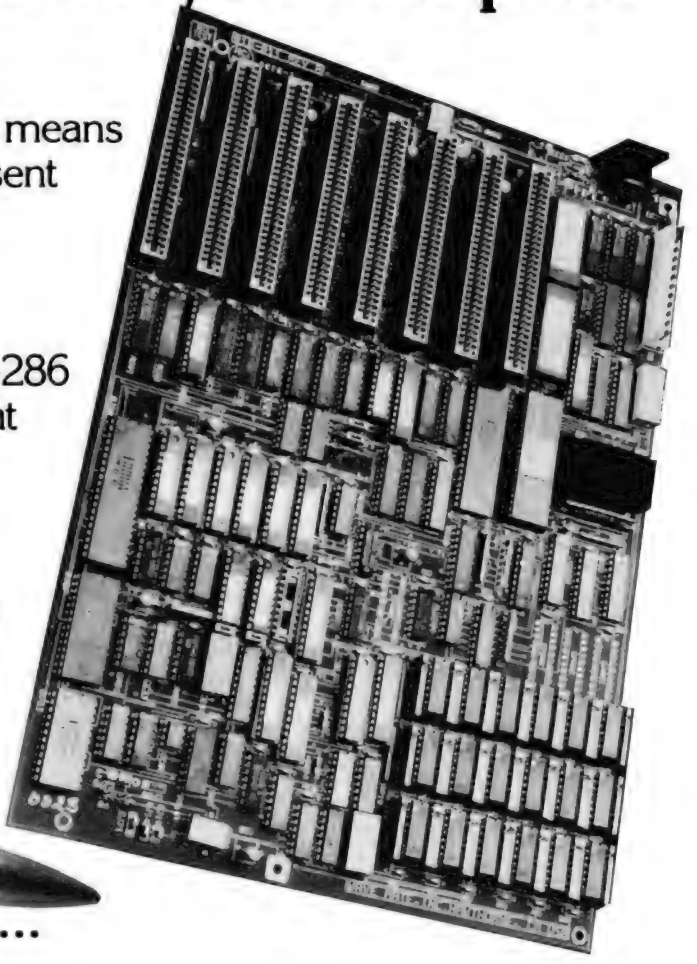

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TPB/623

you've got two drives. CP/M prompts you when to change disks, and also displays the logical name of the current disk in the bottom right-hand corner of the screen.

The manual supplied with the 6128 is up to Amstrad's usual high standard, and covers the extra features of the 6128 comprehensively. Like previous manuals, it takes a quick but understandable tutorial approach, ending with appendices and reference sections. Absolute novices might need a second book to explain Basic, but most users will be satisfied with the manual supplied. A second manual of detailed programmer's information aimed more at software houses is available at extra cost from AWA-Thorn.

Conclusion

From the beginning of October you can obtain an $800 machine with 128k of RAM, a monochrome monitor, a built-in disk drive,CP/M3 and DR Logo; $1,000 will buy you the colour system. The prices are exactly the same as the prices for the current 664 packages and, as such, this has to be rated as outstanding value for money. Irate 664 users should be sure to bombard Amstrad and this magazine with complaints in order that we can attempt to get them the same value.

As a games machine, it is unlikely that many games houses will initially take advantage of the 6128's disk drive or extra RAM. However, if the machine sells well (which it should) then the software should follow. As a serious home/small business machine it's great. You can either use the disk drive to save your own Basic programs, or you could buy the popular CP/M packages and use them to run your small business or to work on data at home.

Either way, it's the disk drive and the price which make this machine. Amstrad reckons that no other manufacturer will dare to release a machine without a disk drive in the future. It could well be right.

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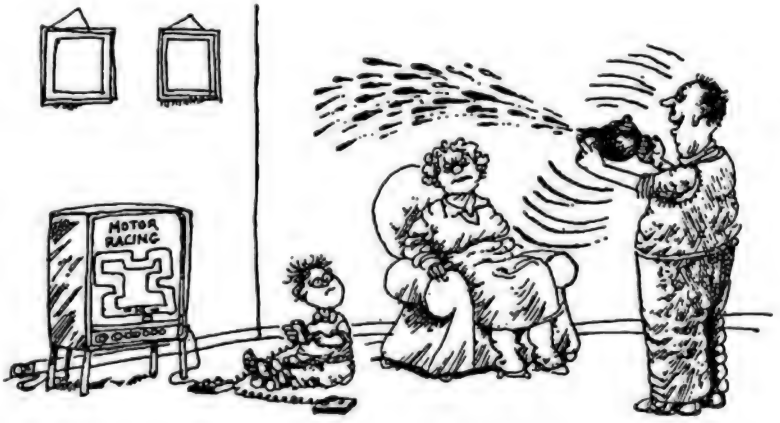

'Of course, the winner should really be spraying champagne about.'

Do portables

The plethora of 'portable' micros has so far failed to produce a reasonably priced, suitably manoeuvrable machine, but two disk-based, IBM-compatible portables might fit the bill — the Morrow Pivot Two and the Ericsson Portable PC. Guy Kewney tested them to see if he'd be carried away. In the second part of this feature John Lettice, Alfred Parr, Robin Webster, Stephanie Stallings and Kester Cranswick test another five machines.

hold all you require?

When portable computers first appeared on the market they weren't very portable at all. The first arrival, the Osborne 1, was heavy and difficult to use, and was basically computer, disk drive and monitor all built into one package, and although you could move it around it wasn't something you did lightly.

The man who launched the Osborne 1 on an unsuspecting world was Adam Osborne, one-time industry guru and self-publicist, who reasoned that buyers would go for the idea of portability even if the substance was a bit suspect.

He was right and the Osborne 1 was wildly successful, so much so that a lot of other manufacturers climbed on the bandwagon and Osborne went bust. He and his company are now back in business separately, but Osborne clearly set the pattern for portable computers. Compaq used his format for its compatible, and other manufacturers, including eventually IBM, followed suit. The 'box-format' compatible seemed here to stay.

Such lightweight, portable PCs are in themselves an attractive proposition. New machines are now arriving, and they are constantly offering better and better features. But the inherently stand-alone nature of these portables has a side-effect that, for some users, can become a severe disadvantage.

Many are made by smaller companies who either do not produce an expansion, box or whose expansion box is 'in production'. Many users will not need expansion cards, but for applications such as micro to mainframe communications they are vital.

The problem is that most portables don't have a synchronous communications capability built in, so in the case of those with card-slots available you'll need to get the relevant card from the manufacturer — unlikely — or you'll need your portable to be plug-compatible so it will take an IBM or third-party card.

Similarly, should you need or wish to connect your portable to a standard IBM SNA network you'll need to expand the system, as the portables with their own comms facilities are generally asynchronous only. The Data General One does have 3276 emulation promised for it, and Grid is trying to improve communications facilities, but at the moment most users will have to treat their machines as unexpanded desktops.

In fact, portables have generally developed in different areas, away from these issues of expansion and connectivity. The original Osborne was improved on by the Tandy 100 and its sister machines, the NEC 8201A and Olivetti M10 two years ago. They led to the term 'lap portable' being coined and

The Morrow Pivot Two: an Osborne 3 upgrade with impressive changes

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they used LCD (Liquid Crystal Display) screens and CMOS chips. LCD screens are light and flat, and CMOS draws very little power, so it's possible to combine the two to produce machines that are light and battery powered.

But here again there are disadvantages. Those machines don't have built-in disk drives, the LCDs are too small (40 characters by 8 lines) for you to get a feel for the document you're working on, and CMOS RAM was so expensive when it first came out that you'd find yourself working with only 24-32k of RAM.

It's clearly impossible to make a machine IBM compatible with a specification like this, so the manufacturers reacted in one of two ways. The likes of Compaq, Olivetti and IBM stuck to the traditional luggable configuration for their portables, while Hewlett-Packard, Data General and Osborne (minus Adam) went for no-compromise portables using the new 80x24 LCDs, slimline disk drives and a lot of CMOS RAM.

Note that these machines are bigger than the earlier lap portables, so you need a bigger lap, and although the LCDs give you a display of comparable dimension to that of a CRT they're difficult to read in anything but the brightest light.

The Japanese are currently working on improved LCDs, and full-colour displays comparable in resolution to domestic televisions now exist in prototype form, but they're complicated to build and it will be some years before they begin to take over from CRT. That leaves us with the compromise technology of the 80x25 LCD.

There's one other dark horse. While most Japanese research is being ploughed into LCDs, a few manufacturers have been experimenting with gas plasma technology. This is power-hungry, so although the Grid Compass, the most famous of the plasma portables, can be battery powered it only has around four hours' endurance, and most of the other plasma display machines around are mains-only.

To sum up, the machines we review here and in the second part of this feature offer a number of attractive features but there is usually somewhere a compromise in their technology. Potential users should weigh up carefully what they will want from an easy-to-carry PC.

Morrow Pivot Two/Zenith 171

At the time of writing, most people seem to be more concerned about the financial health of Morrow than about the technical specifications of the Morrow Pivot Two. The company's problems aren't new — it has been common gossip in the US since November last year that it wasn't making the money it had hoped for from old products, and new products had been slow to reach completion.

Morrow, short of development funds, turned to Zenith, which had evaluated the Pivot One, and licenced Zenith to build the new design. The arrangement has been greeted with astonishment at Vadem, where the original machine was designed. Vadem isn't a large company and Zenith is, so any lawsuit threatened by Vadem is likely to be taken less than seriously by the giant electronics manufacturer.

Zenith is selling the Morrow Pivot Two, with trivial modifications, as the Zenith 171. For nearly all points in this review, therefore, where there is a known difference between the two machines, it will be noted. Otherwise, the choice between Zenith or Morrow will be a simple one: which supplier is most likely to be in business this time next year?

To further confuse matters, the new machine is an upgrade of the Osborne 3, reviewed in *APC's* October 1984 issue.

The changes begin with a much better LCD display, which gives a full 25 lines, and there's ingenious backlighting so that it can be read in awkward places. This doesn't just mean dark rooms, but also places with excessive fluorescent ceiling lights.

It has two disk drives, both one inch in height, which take up very little space but weigh a little more, and it now has both internal battery power (rechargeable) and an external power socket (not mains, but mains derived).

For the man in the street, the difference between the Morrow and the Zenith versions is simple. The Zenith has a green display and will almost certainly be cheaper; the Morrow will have a grey display, a black box, and will be packaged with additional software, justifying a higher price.

Hardware

The Morrow screen isn't quite the same as an ordinary video screen due to the pixels being shorter. For text, this hardly matters — it's all legible. For graphics, which are IBM-compatible, it means that any circles will appear to be horizontal elipses — eggs, if you like. Users might refer to 'egg charts' instead of pie charts, because that's what they'll get.

The fascinating surprise feature of the new display unit is that it is 'soft' and I don't mean programmable — it is squishy. Instead of the polarising gel being squeezed between two plates of glass, the new LCD technology 'peels' off the front glass and puts a strong plastic film there. Touch it, and the display shows the kind of distortion you can see in plastic when viewed through polarising spectacles.

'What happens if you scratch it with a knife?' I asked the supplier. 'You destroy it,' he retorted. Fair enough. If you hit an ordinary LCD with a stone, you destroy it, and if you hit a video display with a brick, it explodes. Don't scratch the soft screen with a knife.

The Morrow screen, darker than the Zenith, has a viewing angle control to point the polarisation towards the viewer. It has a softer backlight. The Zenith, by contrast, is greener and less distinctively separated. It doesn't have a viewing angle control but it is brighter, and can be viewed from a wider choice of

The Pivot Two's keyboard is built into the box

angle so it's more suitable for use by two viewers at once.

The pixels are either on or off — there is no grey-scaling.

On a portable, you can't stretch the keyboard sideways and put extra keys at the side, so IBM's layout (function keys on the left and a numeric keypad on the right) disappears. Morrow tucks the function keys up along the top, under their screen labels.

The numeric keypad is easily dealt with: it isn't there. Instead it is overlaid on the main keyboard so when you switch to numbers you don't lose your cursor keys, but you do lose the main keyboard. Rather than qwertyuiop, the top line of keys gives qwerty456p; similarly, the next line has 123 instead of jkl. This is all very well, but there are many programs which don't understand this and it can cause problems. The cursor keys, however, are always there, even in numlock mode.

Along the top of the keyboard, hinged down from the display unit, are special function keys which perform particular functions. There's a calculator key, which turns the micro into a $10 pocket calculator without interrupting whatever you're doing; this could save you the price of Sidekick or Spotlight. And there's a phone key, which turns on the communications option.

The Pivot Two has a nice, simple shoulder strap for carrying it around, but the box itself is something which has caused disagreement between myself and the designers. They call it a 'lap-held' machine, and I call it a portable. The difference is that if you put this machine on your lap, it will fall over. The Data General One (Benchtested in January) is a lap-held machine, and I've seen people using it to prepare Lotus spreadsheets, even in flight over the Pacific. The Pivot Two weights about 6kg.

The disks are on the righthand side, as you face the box, and you can read the labels when you pull them out. You might think this is obvious, but some other machines don't have this feature.

They are, in all ways except their thinness, IBM disks. They run at the same speed, hold the same data, and obey the same laws of copy protection.

Do not believe absolutely everything you will see if you write away for the sales literature. It shows an expansion box into which you can plug standard IBM cards (like the essential Hercules, for example) and which is attached by a cable to the main unit. This box is essential, I think, but Zenith and Morrow think it's an extra. Morrow wasn't didactic about it, just saying that it wasn't ready. Zenith said it was 'an expensive bell and whistle'.

There is a serial port and a parallel port. There is also, and this is a major feature, a monochrome 'monitor' output for an ordinary video screen, and colour RGB output to drive a standard IBM colour display. Morrow and Zenith are both intending to charge extra for this video board.

The system comes with a minimum of 256k, but fortunately you can easily plug in a total of one megabyte. Only 640k is available to DOS, so why is the extra 360 there? Firstly, there will soon be a new version (version 4.0) of DOS. That will extend the capability of the normal IBM XT to the full megabyte, and, I gather unofficially, may go further. Secondly, the system can use the extra as a RAM disk, loading and unloading data and programs at lightning speed. I don't know exactly how fast because the test machine didn't have one megabyte, but suspicion suggests that it will be slightly slower than normal RAM disk software as it will be switching memory pages. On the Intel/Lotus expansion system of PC memory, this translation takes quite a while.

System software

MS-DOS version 2.11, which is essentially PC-DOS without Basic built in, comes with the machine.

An IBM PC without Basic is a machine which requires another few hundred dollars spent on it, as any number of free utility programs are written in GW-Basic. For example, EasyWriter can convert its text files to WordStar format with a neat little program — in Basic. No Basic, no conversion. (On this machine there was no deviation from standard Microsoft Basic speeds on the *APC* Benchmarks.)

A battery-powered clock/calendar is built in. On power-up, a map of the world (Mercator projection) with various time zones is displayed.

A set-up utility is invoked by pressing one of the function keys. This lets you change the system settings, including whether or not you're using the external monochrome adaptor or colour adaptor, or whether the display will turn itself off after 15 minutes to save the battery, or what time it is, or where in the world you're using it.

Applications software

NewWord is supposed to be bundled with the Morrow, according to the manual. It wasn't bundled with the test machine, but if it is, you can pretend you are working with WordStar. They're very similar. NewWord includes a mailmerge facility and spelling checker.

Documentation

On the Pivot Two, most of the essential information to run the machine comes in a small, square, disk-sized booklet with 200-odd pages.

As these books go, this is quite good. It starts out in a rambling, discursive way, showing how to open the box, what all the plugs and sockets are for, and so on. Then it gets down to turning the thing on and using it, so it is good as guidance for a beginner who is working through as per instructions.

A nice touch is the integration of the utility software with the documentation. For example, the phone manager keeps track of all your phone numbers and names, in RAM. The program which controls this information can save it all to disk, load it from disk, and make sure that information isn't lost when the machine is serviced.

Prices

The Morrow Pivot Two with 256k and one disk but without a video board will cost $4,995. The version with two disk drives will cost $5,794. Other prices are: NiCad battery, $250; video board,

Technical specifications: Pivot Two/Zenith 171

Processor:	80C88
ROM:	32k including calculator, phone function
RAM:	256k min, upgradeable to one megabyte.
Storage:	360k, IBM-standard floppy, second drive installable
Keyboard:	Built into box. Numeric keypad overlaid on main keyboard
Size:	33cms wide, 15.4cms deep, 24.3cms high. Footprint closed, 33cms by 15.4cms; open, 33cms by 34cms
Weight:	6kg with single disk. Battery 0.7kg
I/O:	Serial, parallel phone socket (Bell standard)
Bundled software:	Built-in functions, calculator, phone number storage, MS-DOS 2.11, GW-Basic extra
Options:	Re-chargeable battery, video output board, carrying case.

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$799; carry case, $175; one megabyte RAM upgrade, $585.

As an introductory offer, Archives Computers (the Australian distributor) is offering the dual-drive version at the same price as the single-drive version. The offer is scheduled to expire at the end of September (not much use to readers of this issue), but it's probably worth trying to twist Archives' arm if you're really keen.

The Zenith dual-disk, 256k version will cost $4,895. Ancilliary product prices are: NiCad battery, $149; video board, $499; Carry Case, $149; one megabyte RAM upgrade, $747.

Ericsson Portable

This machine is unique among the briefcase portables tested — in fact, it's unique among PC clones generally.

For a start, it isn't really a PC clone but a very similar machine with several new features. The obvious new feature is the screen, which is bright orange and folds up. Unlike LCD displays, this one is as deep as the video screen which we're all used to. It's also brighter and easier to read. That's what you get for using plasma — but, of course, the penalty you pay is that there's no hope of running it off batteries.

Hardware

The main diskette is the one-inch deep, 5¼in IBM-type drive. A second, external diskette can be plugged into the expansion slot.

More significant, for many users, will be the RAM disk. There is an option called the 'ergo-disk' which plugs into the unit and provides 360k of memory, but this could be better organised.

The ergo-disk is called drive C. It is installed at power-up and immediately disappears. There's a program called CDRIVE which cleverly tells the system that the disk is there, but I haven't found the bit in the manual that tells you to run this program, and the complicated autoexec doesn't do it for you.

RAM disks ought to be automated, and this one is. You press SHIFT, CONTROL and the letter P, and the applications programs are loaded into the RAM disk. The system then tells you it is having trouble reading drive C (it isn't there, it's waiting for you to address drive B), at which point the RAM disk will become drive A, and the floppy disk will become drive B.

Confused? So was I. The assumption is that programs are loaded from drive A, and then refer to data on drive B. This assumption is wildly inaccurate for a great many programs, and if the program starts referring to drive A, then any data files there are easily lost.

I returned to configuring the disk as drive C rather than using the automated process. I tried loading files onto drive C with the COPY command, which worked fine. Then I loaded programs into the RAM disk. That worked, too. When I ran the program, however, I encountered the old problem of not being able to guarantee that the programs would admit the existence of the drive.

The Ericsson Portable: 'unique among PCs generally'

You are advised to buy versions of IBM PC programs specifically configured for the Ericsson PC. I received some odd messages when trying to take standard IBM versions across. In particular, don't try using IBM DOS 3.0 disks on this, which uses DOS 2.11. There are barriers.

The Ericsson screen is red-orange and quite bright. It's possible to change the contrast but not the brightness, which is a shame. I'd never want less contrast, but in sunlight I'd certainly want more

The Ericsson's IBM-style keyboard is light, detachable and easy to use.

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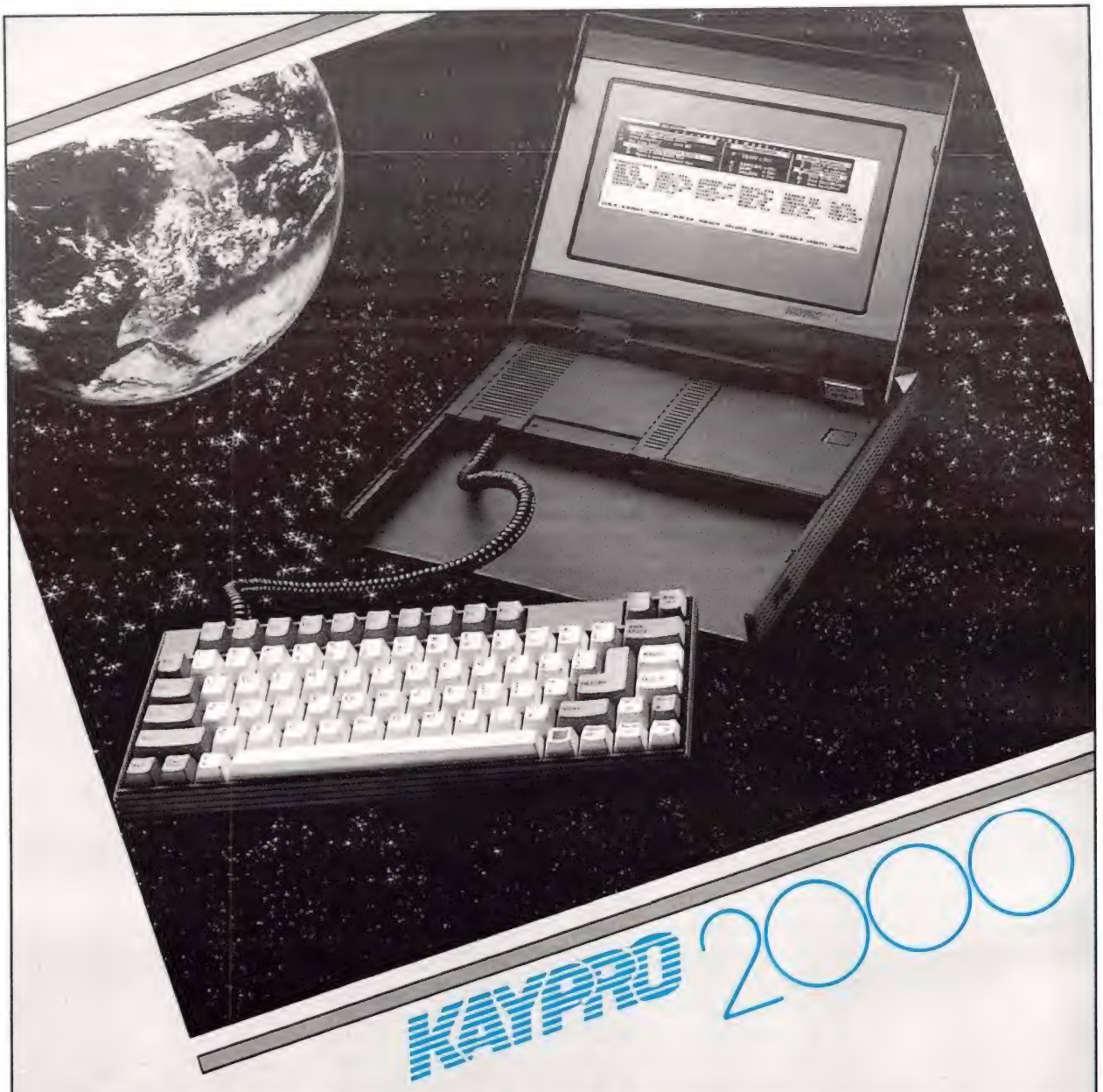

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brightness. Power to the screen is automatically shut down when the lid is closed.

The lid allows a nice variation on viewing angle, but nowhere near as much as the Pivot Two.

Unlike almost any other PC lookalike, the Ericsson has a built-in printer option. It uses a thermal ribbon which makes it quiet, quite low-power, and able to take any paper, not just heat-sensitive paper.

At least, that's the theory. In practice, you need thin, smooth paper, preferably thermal paper, and you shouldn't expect too high a quality of output. Nor should you be in a tearing hurry, as it's rather slow.

The printer takes output from the parallel port; a switch redirects this to the real parallel port.

System software

The Ericsson is supplied with MS-DOS 2.11, but there are so many special alternatives in the hardware that this must be regarded as a different operating system. Messages such as 'You cannot SHELL": to Basic' and 'Wrong version of DOS' will be sent back to you if you try to run IBM software out of the box.

The RAM disk software appears to work, but is so unlike the conventions expected under DOS that it almost becomes a hazard to the unwary user.

Applications software

An ordinary version of GW-Basic has been configured for this machine. The test version came without a Basic manual, so it wasn't possible to test its ability to handle the RAM disk as a peripheral except under the SWAP function, which I found very confusing.

Documentation

The manual is small but is nonetheless tedious, repetitive and hard to pick your way through. After much searching, usually, I found that the information I

Technical specifications: Ericsson Portable

Processor:	Standard 8088
ROM:	No details available
RAM:	256k expandable to 512k
Mass storage:	One-third height floppy, 360k, optional plug-in drive, 360k RAM disk
Keyboard:	IBM-style, with function keys across the top in two groups of five. Detachable, light and quite easy to use, but flat, not ergonomically rounded
Size:	15.3ins across, 12.1ins deep, 4.5ins tall
Weight:	Around 6kgs.
I/O:	Standard IBM serial and parallel plugs
Peripherals:	Standard IBM communications ports to drive printer and modem. Optional built-in printer available, uses COM:1 slot

The machine is not battery-powered, and uses as much power as a standard desk-top unit. It is fitted with a cooling fan.

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wanted wasn't there, but it does come in a nice ring binder.

Prices

The basic price for a 256k machine with one floppy disk is expected to retail for $4,500. The printer is approximately $600 extra.

Pricing of add-on memory is hard to calculate, as it depends on whether you have the RAM disk ergo-disk. There seems to be some confusion about whether you can have a 360k ergo-disk or whether you automatically get a 512k one, and what happens to the extra 162k if you do. The system only gives 360k as a RAM disk.

However, a 512k system with ergo-disk will cost around $5,500. You can get a PC/AT for that kind of money, with 20Mbytes of hard disk.

Although the side of the machine shows a slot for a hard disk, the company tells me that a 'hard disk is not available, and we have no price information'.

Similarly, the expansion chassis is theoretically available, which means memory expansion is possible, but 'no price for that,' says the company.

Ericsson is currently restructuring prices which means prices quoted are approximate and do not include sales tax.

Conclusion

It would be nice to say that one of these machines stands so far above the other that it must be the choice, but too many features are still undecided for this to be possible.

The Ericsson has more features packed into the box than any other portable, with printer, full-sized display, disk and RAM disk, but to get there, you have to pay an extraordinary price. The RAM disk isn't obvious to the user, nor is it foolproof. I prefer the Morrow option of a proprietary software package to drive the Pivot Two's full memory map. There is just no way that the Ericsson will ever run off batteries because it runs very hot, and the display chews up power, too.

If Ericsson had any plans to release a hard disk or an expansion box (into which you could plug IBM-compatible cards) it would be recommended as a useful IBM lookalike, without mentioning its portability. But, although the slots are there to take these devices, the company regretfully admits that there are no such plans. The beast is not really compatible enough to compete with desk-top imitations — even Ericsson's own PC is a closer clone. You cannot be sure of transferring software to this portable.

The Pivot Two has the option of including not only a monochrome CRT output, but also a colour display. There is so much graphics software which makes creative and powerful use of colour (and quite a lot of non-graphics stuff, too) that this must be regarded as important.

The Pivot Two also has the advantage of dual diskettes, which isn't a totally indispensable feature but is indeed a big plus. The extra diskette on the Ericsson comes at a price that made me whistle.

Ultimately, you will probably make a choice on price. I wish I could help you here, but prices look quite unstable. Clearly, with the number of PC lap-helds coming onto the market at the moment there will be fierce price competition. And when you have two essentially identical machines with the enormous price disparity of the Morrow and the Zenith, it is obvious that pricing policies are at an uncertain stage and are going to require some quick adjustments by the distributors.

As Zenith doesn't believe in putting high price tags on machinery, and is prepared to leave off the odd bell and whistle to bring the price down, competition there will be. END

In perspective

Ultimately, one can envisage technology providing us with a keyboard and display, weighing around a kilogram, and in constant radio contact with the desk-top storage and control unit 'back home'. Today, however, the need to carry at least one floppy disk drive for data storage makes portables too bulky and weighty to truly live up to their name. The need to read IBM 5¼in diskettes doubles the weight and volume penalty.

These machines all prove the point. They are more portable than a desk-top monolith, and even more portable than something like a Compaq, but they really aren't lap-helds. In the case of the Ericsson, as it isn't capable of being battery-powered, one wonders what the point of designing it was.

Both machines are aimed squarely at those who do a lot of work at home and a lot somewhere else — someone's office, for example. They are also aimed squarely at the person who has to share an office, data and programs with people having standard IBM PCs.

My own preference, on technology only, is for the Morrow Pivot Two, followed by the Zenith version (less clear display), with the Ericsson trailing a long way behind. The Data General One should also be considered by someone who just has to have an IBM-compatible 'lap-held', too.

But anyone thinking of just buying a machine which will run IBM software should go for a good desk-top clone such as the Compaq, or the go-faster Olivetti, or the Commodore and use a standard lap-held NEC 8201 or Tandy 100 as their data capture device.

Guy Kewney

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PC portables

(Part 2)

Following up Guy Kewney's Benchtests of the Morrow Pivot Two/Zenith 171 and Ericsson Portable, John Lettice, Alfred Parr, Robin Webster, Stephanie Stallings and Kester Cranswick test another five portables to help you make a suitable choice.

Kaypro 2000

Kaypro machines are old friends to many micro users. By tradition they're heavy and ugly, but good value and reliable, to the extent that the Kaypro 'look' has become an advantage.

The very first of the Kaypro machines were CP/M Z80-based, and more recently the company has introduced PC compatibles (the Kaypro 16, for example, which is an XT-compatible portable), but until now the standard Kaypro format has been a solid-looking box with a sinister steel hood shading the screen.

The breach of etiquette in question is the Kaypro 2000, a versatile and surprisingly stylish IBM-compatible lap portable. The 2000 is rare — there were only half a dozen in Australia at the time I saw it — but it looks good enough to become a big seller once supplies start coming through.

The machine has an 8088 processor running at 4.77MHz, the same processor and speed as the IBM PC, so it should be one of the more compatible of the portables. Like the GridCase (see the next review) the Kaypro has a 720k 3½-inch drive, so you can't just put in a standard PC disk and go, but unlike the GridCase the Kaypro will come with a wide range of bundled software.

Bundled software is pretty much a Kaypro trademark, allowing you to walk in off the street, buy a Kaypro and walk out with a complete package that will perform most common tasks. The bundled software consists of WordStar, Mailmerge, K-Desk (which is Polywindows), a 'Travellers Expense Manager', MS-DOS and GW-Basic. This won't altogether obviate the need to comb the stores for 3½-inch disks, but it does help. For slightly more pressing needs, however, Kaypro is claiming that it will have a 5¼-inch drive available in a couple of months.

Kaypro 2000: A versatile and surprisingly stylish compatible.

As far as looks go the 2000 is light years away from the standard Kaypro format. It's styled in the standard Kaypro metallic grey, and when packed up it's tough, but it really is surprisingly small and elegant.

To use the machine you lift up the lid, and as is becoming the industry standard, the lid's inside houses an 80x25 LCD screen. The machine powers-up automatically when the lid is raised, and according to the manual you then have

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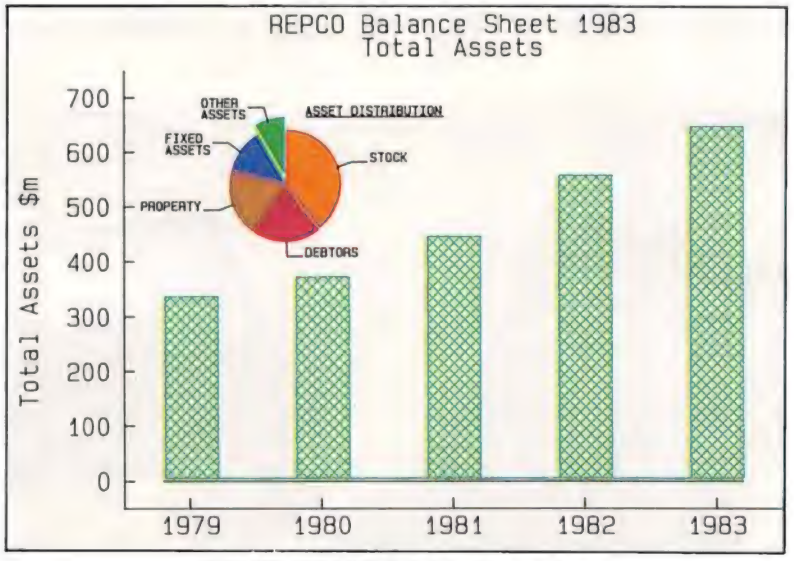

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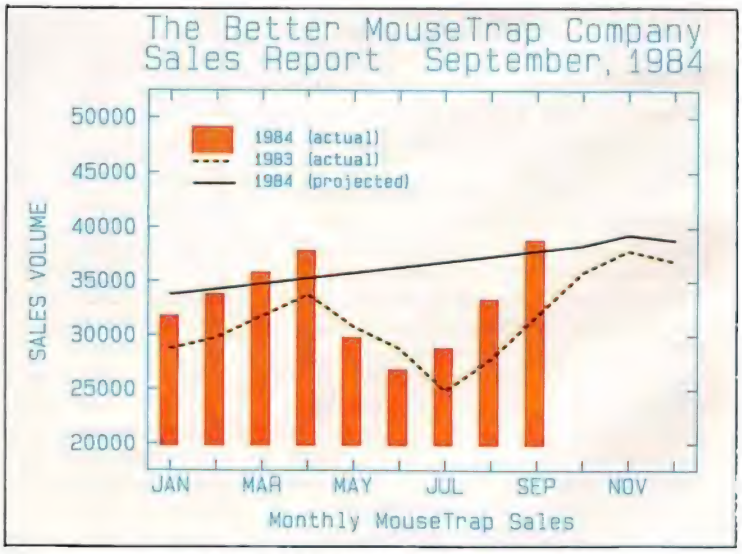
Graftalk is easy to use
Even a first time user can produce a sophisticated graph with a few simple commands. As you gain more experience, you can choose to use any of GrafTalk's more than 100 commands. Commands are available that allow all degrees of "fine tuning" for your graphs.

GrafTalk has excellent documentation
GrafTalk's documentation is readable, complete and easy to use. The User's Manual consists of full color examples designed to show you step-by-step how to produce the graphs you want. The Reference Manual classifies and describes fully every available command.

Chances are it works with the hardware you already have.
GrafTalk runs on CP/M-80 systems (even those without screen graphics), the IBM-PC, Sirius, DEC Rainbow, Zenith Z100, and many more. 16-bit systems need only 128kB of memory.
GrafTalk drives so many screens, plotters, and printers that we don't have room to list them all. Development is continuing — watch for the release of support for Apricot and the Textronic color ink-jet printer.

(Charts shown here were produced with Houston and Hewlett-Packard plotters, on a Televideo 803.)



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The inbuilt spreadsheet allows the user to view and adjust data, perform arithmetic operations, create new rows and columns, name rows and columns,create sub-sets, and output data to disk or printer. Unassigned values are allowed.

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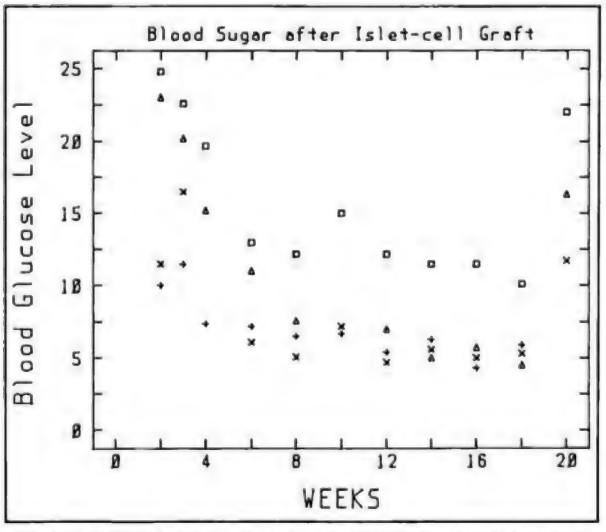
High-speed screen oriented menus are provided. Write your own menus for your standard operations. Switch between menu mode and command mode at any time.



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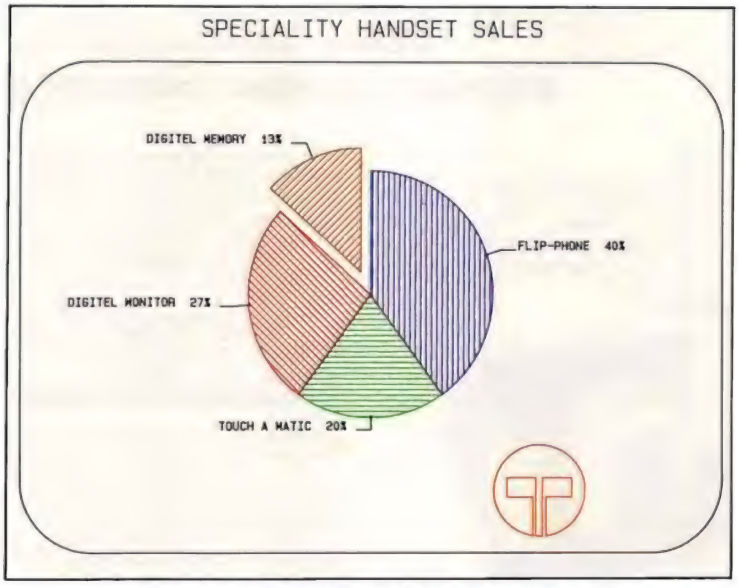
Declare variables, interactive sketch commands, circle and arc, absolute and relative moves, draws and marks, screen or graph coordinate systems.



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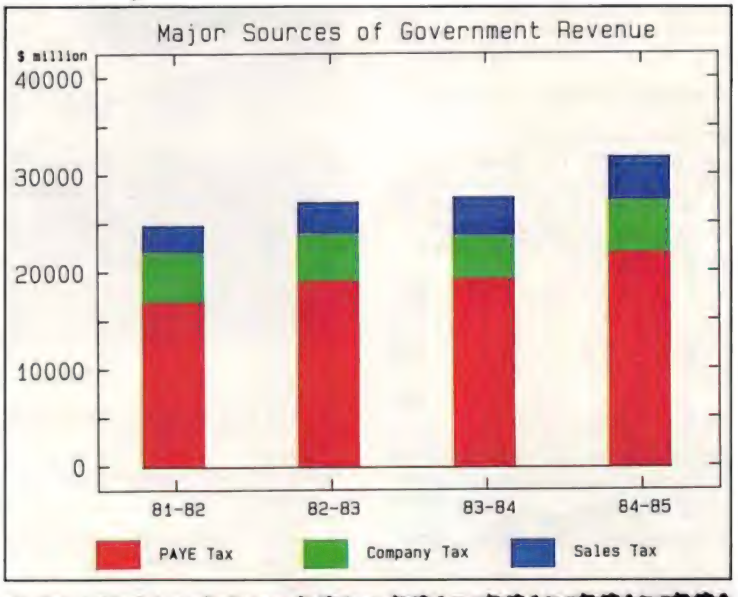

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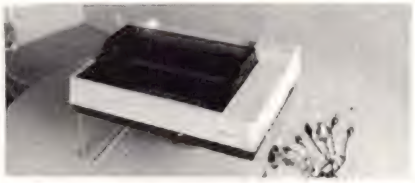

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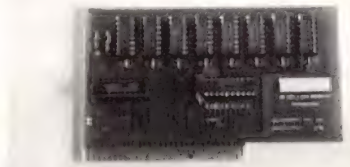

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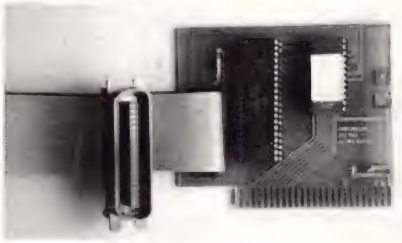

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35 seconds to put the system disk in the drive.

Neat structuring

The keyboard is at the front of the base unit, and behind this, just by the base of the screen, there is a neat little disk complex. The drive itself is on the right hand side, and has to be tilted up slightly to be used, while the left hand side has enough space to house a couple of disks.

The keyboard itself isn't IBM standard, although it's not as wildly non-standard as the Grid's. In common with many other portable manufacturers Kaypro has put the 10 function keys across the top of the keyboard rather than at the side — this saves a certain amount of space, and is arguably more logical.

Space considerations also mean that there isn't a separate numeric keypad — instead there's a number lock that allows a group of keys on the main keyboard to fulfill this function. There is however space for a line of four cursor keys on the bottom right — they're not in cluster formation, but they're better than nothing.

The outside of the machine is completed by the addition of serial port, a jack for an internal modem and an expansion bus. The latter is on the base of the machine, and is included to allow you to connect up the Kaypro expansion box, which should also be available in the next couple of months.

This means you can plug in IBM expansion cards, and design-wise gives you a hint of the way some people feel portables should develop. The theory is that the portable of the future will form the keyboard of a desktop system and/or mainframe terminal. So, when you are in the office you use the full system, and when you're out and about you use the portable/keyboard.

The Kaypro sits on top of the expansion box, and the keyboard can be lifted out of the main unit so that it's cord-connected in traditional PC fashion, so you could conceivably have one powerful system on your desk to be used in conjunction with a portable that is part of the system.

Seeing the machine in this mode makes you wonder if it really is a Kaypro. It's light, and it has a couple of little feet that spring out to tilt it to the requisite ergonomic angle. It looks positively flimsy when compared to the more traditional Kaypro keyboard, which tend to be large sheet-steel wedge shapes.

But even on its own the Kaypro is powerful. The basic machine has 256k RAM, which can be expanded internally to 768k, and the 720k drive should provide a fair bit of scope for computing that needs to be done on the move.

Seen on the screen

Although the Kaypro's 80x25 LCD is pretty much today's standard for portable computing there are a few added frills. For example, a battery low indicator shows up on the screen when you've only an hour left. The machine operates on batteries for four hours, and as these are rechargeable you can use the machine on mains power and charge the batteries at the same time.

The Kaypro's display is pretty much today's standard but there are a few added frills.

The method of adjusting screen contrast is curious. This is done by pressing CTRL/ALT/F1 to decrease contrast, and CTRL/ALT/F2 to increase it. It's also possible to perform a hard reset from the keyboard with CTRL/ALT/ESC — Kaypro seems to have taken a policy decision to keep switches to a minimum.

As far as the quality of the display is concerned, the Kaypro is perfectly usable provided the lighting is reasonable. As the display is grey LCD it obviously isn't as good as some of the newer 'bright ideas', but its legibility is well up with the leading 80x25 LCD machines.

As Kaypro 2000s are in exceedingly short supply at the moment it wasn't possible to put the machine through any rigorous testing, but on first impressions it looks like a sturdy machine with a lot of potential.

It's also good to see a company with Kaypro's reputation for value entering the lap portable market — most existing portable manufacturers price their machines above the level of the equivalent desktop system, but with Kaypro (and Toshiba, see review later in this feature) coming in at around $3,000 for a 256k machine with single drive and bundled software we may be about to see this change, and this could provide quite a boost for portable computing. At the moment portables tend to be seen as a luxury, and are priced accordingly. But there is no basic reason why workaday computers have to be desktop sized and the Kaypro 2000, is doing its bit to change people's preconceptions about portables.

The main questionmark over the machine is the disk format. Kaypro will be supplying software with it, but currently there's little 3½-inch PC software around, and although the 5¼-inch external drive is a solution, it's hardly an elegant one.

On the plus side 3½-inch drives are becoming more common, and even if IBM doesn't give them its seal of approval it should be possible to switch disks between compatibles. Provided this can be done the Kaypro 2000 should establish itself as one of the best value and most usable portables on the market.

Technical specifications: Kaypro 2000

Processor:	8088
ROM:	No details available
RAM:	256k min,
Storage:	Single 720k 3½-inch drive
Keyboard:	Some variance to IBM standard: Function keys across the top, numeric keypad overlaid on main keyboard. Detachable from main unit.
Size:	Open 33cms x 29cms x 27cms; closed 33cms x 29cms x 6.5cms
Weight:	5.75kg
I/O:	Serial port and expansion bus.
Bundled software:	WordStar, Mailmerge, K-Desk, Travellers Expense Manager, MS-DOS and GW-Basic.
Options:	Hayes compatible internal modem (1,200 and 300 baud) $540, including a modular telephone attachment; Disk Adaptor (basically a cut-down version of the base expander unit) which has ports for 5¼-inch and 3½-inch drives, a parallel port and a slot for a 'half size' IBM compatible card, such as an RGB card, price $185; PC Card, which slots into an IBM PC and connects to the 5¼-inch slot on the Disk Adaptor allowing the Kaypro to make use of the 5¼-inch drive on the IBM, $75.

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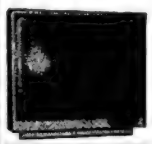

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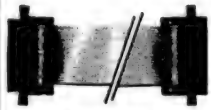

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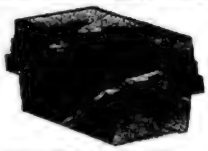

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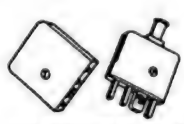

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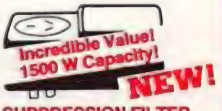

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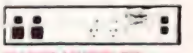
Cat. X10094 **$39.95**



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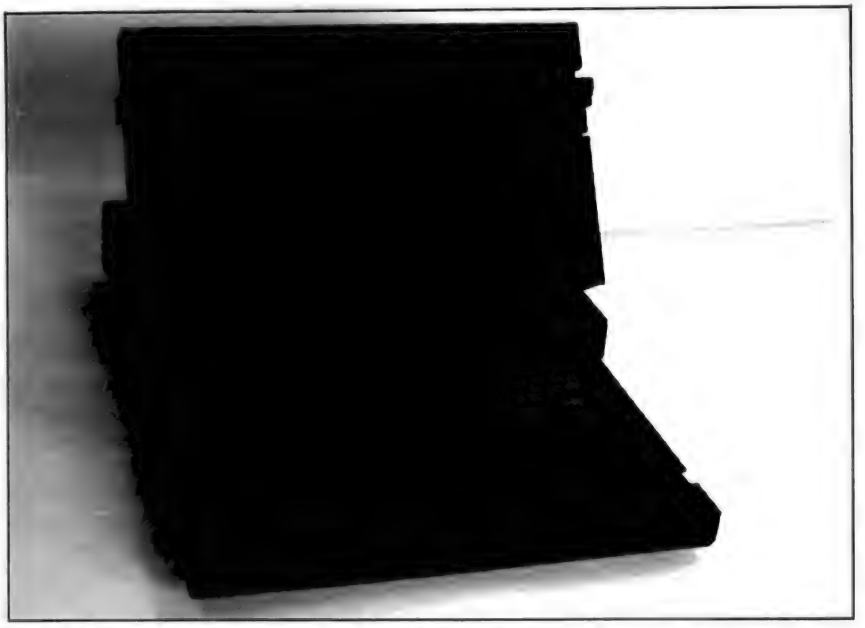
GridCase



The GridCase is an elegant, powerful and efficient portable computer.

Who hasn't stood outside a car showroom drooling at a Porsche. The expensive sports car is generally seen as a sign that someone has 'arrived' but nowadays, as portable computers become popular, people are more and more to be seen carrying a Grid portable — it's the micro equivalent of a Porsche, and just as soon as I arrive I'm going to have a Grid portable sitting on the passenger seat.

Grid's earlier portable, the Grid Compass, had established a reputation as a rugged and powerful, 'no compromise' machine — so much so that it's favoured by the US military. Grid sees defence and security as major sales areas for the machines, and it's also used by US Internal Revenue Service field workers.

But although the Compass has the power and backup to operate effectively as a stand-alone machine its lack of IBM compatibility and its price have been a brake on sales growth. This is set to change with the introduction of the 80C86-based GridCase, which is IBM compatible and runs both MS-DOS and Grid's own GRID OS operating system.

The GridCase isn't as tough as the Compass, but it's still tougher than practically any other portable you're likely to meet, with the exception of the likes of the special-purpose Husky, which is proofed against elephant footprints, among other things.

The GridCase comes in a slim black magnesium case the size of a small briefcase. Simply put the case on the desk with the end facing towards you, lift up the hinged lid and the front half becomes the screen, revealing the keyboard beneath. The back half of the box houses a wealth of input/output (I/O) ports and a single 3½-inch 720k drive. The whole setup is incomparably neat and bears all the marks of 'status'.

But the GridCase is much more than an executive toy, and if its superb engineering leads it to be marked down as such this is more a comment on the standard of other portables than on the Grid itself. The original Compass uses an electroluminescent screen — similar in many ways to plasma — but the GridCase offers a choice of three displays. The basic version is standard grey LCD, but an enhanced, or 'yellow' LCD is also available, and a plasma screen version sits at the top of the range. All three displays are the same, that is 80 characters by 25.

A yellow display

The review machine used the yellow LCD — this was the first of these I'd seen, and I was extremely impressed. The screen has yellow tinges, but the overall impression is of blue on a blue-green background, and unlike grey LCDs it's not particularly angle-critical, so a group of people can stand round the machine and all be able to see the screen.

The machine has the capability to switch to 132-column mode, and even this was as legible as the standard display on some other portables. The yellow display also draws less power than grey LCD, so the battery endurance is increased.

However, the keyboard is not so satisfactory. It's of the standard qwerty size, but the function keys are shifted values of the numeric keys along the top, and the ALT key is shifted, making for a certain amount of 'high jinks' when you're carrying out a warm boot. There's a separate cursor cluster, but the positioning of the RETURN key means that the down arrow is slightly offset.

There is however a good reason for the cramped feel to the keyboard. At the top left of the keyboard unit there's a lift-out hatch, beneath which there are four ROM sockets. These allow you to fit up to 512k of ROM, so software (including, if you choose, MS-DOS) can be loaded from cartridge rather than disk.

One slight gripe is the fact that you have to switch the machine off before you plug the ROM in. Atari has been selling machines that automatically power down when you try to plug a ROM cartridge in for years now, and I think with a bit of thought Grid should master this simple mechanical procedure.

The 3½-inch drive is a sign that, although it's gone IBM compatible, Grid is still ploughing its own furrow. There is a wide range of Grid software available, particularly in the communications field, where Grid markets IBM 3101 and VT100 terminal emulation programs, and in addition to this most standard PC-DOS packages can be run. In order to do this you need a 5¼-inch drive, which is supplied by Grid.

Grid could be criticised for supplying the machine with a 3½-inch drive rather than a 5¼-inch one, but this is one of the Catch 22s beloved of hardware reviewers. If the machine has been supplied with an IBM style drive you could equally well moan about manufacturers who supply low-capacity and outdated 5¼-inch drives!

The Grid expansion system is in itself interesting. The 5¼-inch drive isn't particularly compact, but the representative who delivered the review machine managed the machine, a 10 megabyte hard disk and two power packs in a shoulder bag without looking too distressed.

Under normal circumstances, of course, you'd keep heavy items like external drives on your desk and just move the GridCase around, so weight isn't all that important for add-ons.

Grid markets the drives and a base station/battery charger in a uniform format, each being the sort of black box half the size of the Grid. They stack vertically and have built in connectors, no cables, they just plug into each other, so if you acquire a range of add-ons you have the equivalent of a desktop system, but with the difference that you can pull out its 'brains' — the GridCase — and use that on the move.

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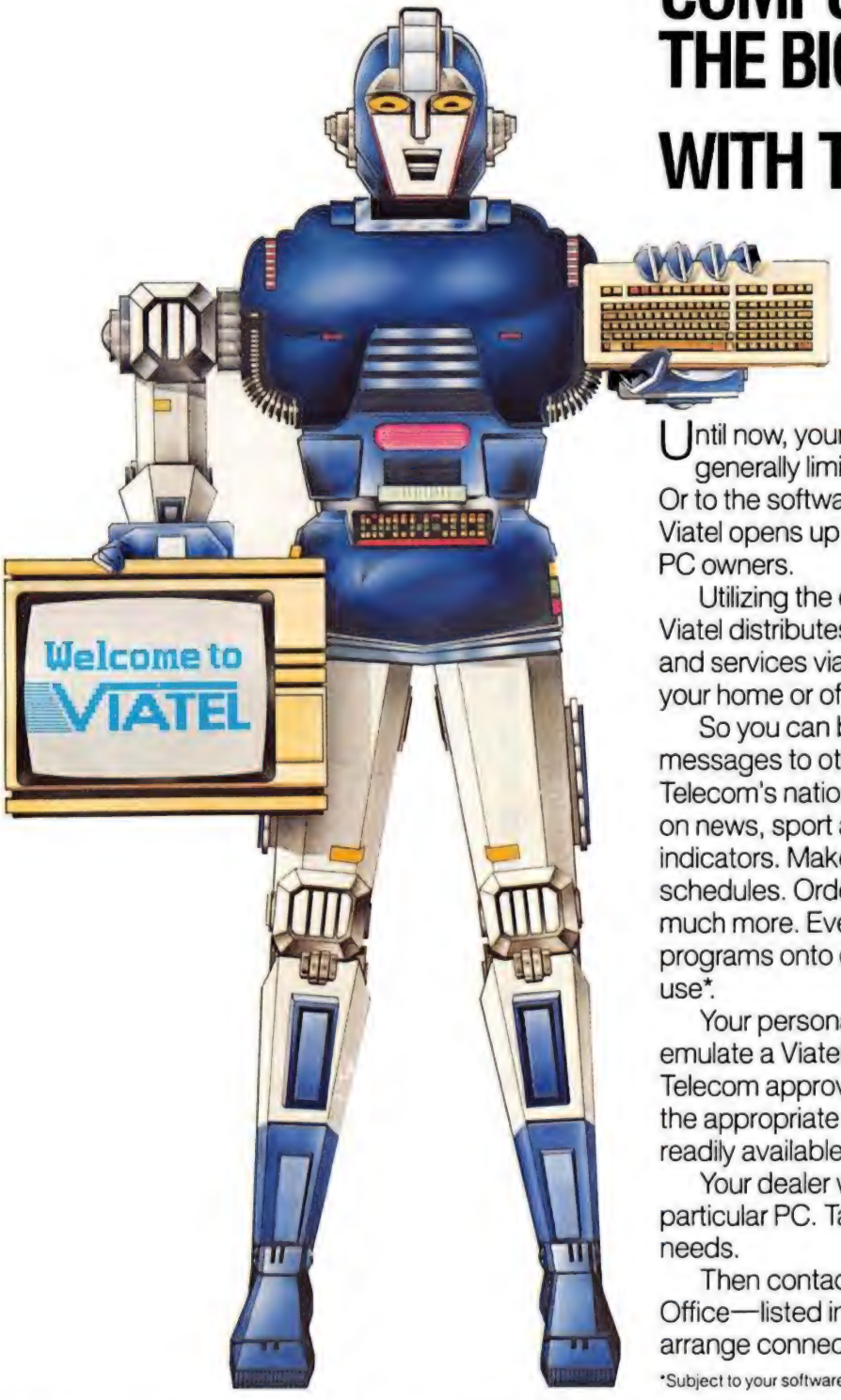

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General					
Menu driven	yes				
Fully integrated	yes				
End User Support available	yes				
Complete Audit Trials	yes				
Uses standard preprinted forms	yes				
Codes File Database available	yes				
Full Recovery for Corrupted Data	yes				
Estimating Feature for File Sizes	yes				
General Ledger					
Double Entry Accounting	yes				
Unlimited number of accounts	yes				
Departmentalized Financial Statements	yes				
12 or 13 month budgeting	yes				
Detailed Trial Balance	yes				
Monthly, Quarterly and Annual Analysis	yes				
Income Statements, Balance Sheets and Journal Listings	yes				
Special reporting feature built in	yes				
Accounts Receivable					
Open item balances	yes				
Unlimited Customer Accounts	yes				
Supports retail and wholesale pricing	yes				
Prints invoices, credit notes and statements	yes				
Order entry via Item/Part File	yes				
Detailed Departmentalized Sales Analysis	yes				
Handles unapplied credits	yes				
Supports partial payments	yes				
Automatic monthly invoicing	yes				
Taxable and non taxable items on the same invoice	yes				
Calculates finance charges	yes				
Prints mailing labels	yes				
Prints aged accounts receivables	yes				
Allows multiple ship to and bill to accounts	yes				
Prints overdue invoice report	yes				
Flexible ageing periods	yes				
99 different bank accounts or terms details	yes				
Allows alternate language					
Accounts Payable					
Prints aged payables	yes				
Detailed general ledger distributions	yes				
Cash requirements planning	yes				
Prints payment registers	yes				
Maintains up to 99 different Data Codes	yes				
Automatic general ledger input	yes				
Prints Audit Trials of Input Data	yes				
Allows modify postings prior to update	yes				
Automatic discount calculation	yes				
Cheque calculate routine	yes				
Cheque register report	yes				
Inventory					
Supports stock and non stock items	yes				
Tracks open purchases at item level	yes				
Handles purchases, returns, shipments and adjustment	yes				
Minimum and maximum stock levels	yes				
MTD and YTD activity	yes				
Stock status reports	yes				
Purchasing advise	yes				
Alternate language facility	yes				
Backorders by item or customer	yes				
Keeps re-order, economic order qty. and on order details	yes				
Allows different stocking unit of measure to invoice	yes				
99 different sales tax rates and general /sales accounts	yes				
Average cost, last cost, or manual costing	yes				
Backorder and open order control reports	yes				
Daily, monthly, and yearly status reports	yes				
Re-order and inventory valuation reports	yes				
Sales Analysis					
Sales analysis by customer	yes				
Sales analysis by customer sales volume	yes				
Sales analysis by customer type	yes				
Sales analysis by responsible sales person	yes				
Sales analysis by territory	yes				
Sales analysis by inventory items	yes				
Sales analysis by item category	yes				
Sales analysis by item sales volume	yes				
The Big Difference Price Comparison	$1495*	$3000*	$2690*	$3850*	$3000*

*Approx. Recom. Retail Price at time of pub.

Possible expansion

It's also possible to expand the machine in the same way as you would expand a desktop PC. The back of the Grid is practically solid I/O, with a Centronics interface, RS232, expansion bus that is compatible with the IBM PC expansion chassis (so any IBM card can be used) and RGB and keyboard connectors.

These last two features are particularly interesting, because they're both IBM standard. The theory is that you close up the Grid then connect a standard PC keyboard and an RGB monitor and you have a system more powerful than the IBM PC that takes up a fraction of the space. The keyboard connector comes as standard, but to use a monitor you'll need to outlay another $600 for an RGB video card which fits into the Grid.

The other item of interest round the back of the machine is the rechargeable battery pack. This charges up while the machine is plugged into the mains, even if you're using it, and can be slotted out and exchanged for another pack if there's no mains socket within handy reach at the time.

The GridCase's MS-DOS operating system means most PC programs will run on it, although you may have problems getting some of them in 3½-inch disk format, and this is liable to persist until IBM sees sense and starts producing machines with this sort of drive.

However, there shouldn't be any great problem obtaining the more popular programs, which should be adequate for most purposes. Anything more esoteric can of course be run from Grid's 5¼-inch or hard drive add-ons, although this naturally adds to the total weight of the package.

But for the busy, and perhaps non-computer-literate executive Grid's own software has certain attractions. These run under GRID OS, which is Grid's own extremely simple operating system and include word processing, spreadsheet, graphics and database programs. Grid has also announced a forthcoming package, GridTransfer, which allows you to exchange data between GRID OS and MS-DOS environments. Grid's communications software range is also one of the more extensive available, and if comms is important to you this alone will make the machine worth considering.

It's actually rather sad that Grid has felt the need to supplement GRID OS with MS-DOS, as the former is a spirited attempt to make computers easy to use, but the onward march of PC-DOS makes compatibility inevitable. At least the two systems are being run in tandem, so Grid may find that this 'Trojan Horse' approach will popularise its own system.

The Grid Compass uses bubble memory for storage of data, and while this is efficient it's considerably more expensive than the more popular CMOS RAM. And as this only allows 384k of data storage the Compass could be seen as under powered by today's standards.

The GridCase range, however, offers up to 512k of RAM plus a single 3½-inch drive, which at 720k provides equivalent storage to that of a twin floppy PC. If you're using this for data storage along with one of the ROM cartridge programs it makes for an exceedingly fast system, even using IBM's geriatric 8088 CPU.

Prices

Just about everything is quoted as an optional extra, including the operating system!

MS-DOS on disk sells for $275, as does GRID OS; alternatively MS-DOS can be purchased in ROM for $620. The basic LCD machine sells for $5,400; the enhanced LCD model, $5,700; and the plasma screen knocks the price up to a whopping $7,500.

Extra memory is also not cheap. A 256k machine costs $1,000 over each of the prices listed above; and 512k adds just over $2,000.

In conclusion

The GridCase is elegant, powerful and efficient. It does practically everything you'd want a portable computer to do, to the extent that I'd describe it as the blueprint every portable manufacturer should study. Yes it's pricey, but you've got to pay for perfection.

Technical specifications: GridCase

Processor:	80C86
ROM:	Diagnostics and BIOS plus expandable to 512k with ROM cartridges
RAM:	128k expandable to 512k.
Storage:	Single 720k 3½-inch drive. Optional external 5¼-inch drive.
Keyboard:	Some variance to IBM standard: Function keys are accessed by 'shifting' and 'ALTing' the numeric keys. Numeric keypad available as an optional extra.
Size:	38cms x 29cms x 5.7cms closed. Approximately 16cms tall when opened.
Weight:	5.5kg
I/O:	Serial and parallel, IBM expansion chassis — compatible expansion bus and keyboard connector.
Bundled software:	Nil
Options:	MS-DOS GRID OS (both approx. $275), RGB video output card around $630, 8087 math co-processor $370.

Data General/One

The Data General/One was one of the first 'serious' lap portables to come onto the market and was Benchtested fully in the January issue of *APC* but is included in the overview for the sake of completeness. It weighs in at four kilos, has two internal 3½-inch disk drives and an 80x25 character LCD screen. Externally you can fit an expansion chassis, a Monitor/Printer/Display Adaptor, a separate 5¼-inch disk drive and a four pound printer — it's a lot of machine, but then it will cost you a lot of money.

The basic system consisting of computer with 256k RAM, one 3½-inch internal disk drive and absolutely no other internal or external components costs $4,995. This puts it fairly near the top of the portable league as far as price is concerned, and although it's a sophisticated system you'd need to want all its functions fairly badly to be able to justify the expense.

The DG/1 measures 35cms deep by 30cms wide by 7cms high so, while you can hold it on your lap, it's much more comfortable to use it on a desk.

The machine is controlled by three printed circuit boards (PCBs) with the main one carrying the CPU, RAM, ROM and display and keyboard controllers. It can hold a maximum of 512k of internal memory, with 48k of this reserved for display memory, although the optional expansion chassis will hold up to five extra 128k cards. The CPU is the CMOS version of the 8088, the 80C88.

The second PCB handles I/O (Input/Output) and contains the floppy disk controller, two asynchronous interfaces and a real-time clock. The power PCB controls the rechargeable battery pack, which will run for up to 10 hours — it's

also possible to plug the machine into a mains adaptor.

The cover of the machine lifts up to reveal the keyboard and the screen, which is the DG/1's most disappointing feature. Using it involves constant, annoying adjustment of the contrast, the lighting and your own position as you attempt to view the screen comfortably. You can't improve the viewing angle by adjusting the slant of the screen, and you have to stay within a 30 degree horizontal arc of it. These problems make it difficult to appreciate the quality of the 256x640 pixel resolution display.

Data General clearly appreciates the problem, as it has introduced a new 'non-glare' optical quality lens for its screen on later models. This reduces glare a little, but not dramatically.

The DG/1's keys are tightly-packed, but not uncomfortably so, and their clicky feel is just about right. Special purpose keys such as HOME, PGUP, PGDN, END and PRTSC have been relegated to the top and bottom rows on the far right. The function keys run along the top row, while CTRL, ALT and DEL are close to their usual places. An extra key, CMD, increases and decreases screen brightness when used with PGUP and PGDN. The numeric keypad is marked in red and superimposed on the alphabetical keys, and comes into action in NUMLOCK mode.

The 3½-inch drives are on the right

Data General/One: one of the first 'serious' lap portables on the market.

hand side of the machine, which means you have to peer round the side of the machine to insert a disk. The main advantage of the disks is that they're 720k, twice the capacity of 5¼-inch, and it's perfectly simple to swap data between the two types of drive with standard DOS commands.

The external 5¼-inch drive is serviceable, but is large, heavy and unwieldy — it's definitely not the sort of peripheral you'd want to carry around with you. Using the drives can be a little confusing. The DG/1 treats whichever drive you boot from as the A: drive. This makes sense if you're running a 5¼-inch format program that's drive critical, but it can make things difficult to keep track of.

The DG/1 includes a built-in functions package that appears automatically if you switch on and don't insert a DOS disk, and you can also access it by pressing CTRL/ALT/CMD. The package is stored in ROM and has four major functions — Setup, Notebook, Terminal and Diagnostics.

The setup function is used to configure your system for printers, external displays, modems and disk drives so the machine knows what you have attached. Notebook is a simple but adequate editor that uses function keys to manipulate text — it doesn't have word-wrap, so you have to press RETURN at the end of each line.

The Terminal function sets up communications protocols for using the machine as a Data General terminal. It's also possible to obtain IBM 3270 terminal emulation software.

There's no problem running IBM software on the DG/1 — it can either run from the 5¼-inch drive or be downloaded to the internal drive. The machine is however significantly slower than the PC, whichever drive format you're using. Its boot time for WordStar is eight seconds, and it takes 38 seconds to read a 10 page document, while an IBM PC took 31 seconds.

Computing in the field is made a lot easier by DG's lightweight battery-operated thermal printer; at 7.5cms high, 10cms wide and 30cms deep, it is genuinely usable. It prints on smooth paper with a thermal transfer ribbon or on thermal paper without the ribbon and, although its draft quality is a little light, the bolder print is very good.

The internal modem mentioned as 'coming' in the January Benchtest has still not arrived. At the moment Data General is 'testing a US modem' which, if successful, will lead to DG seeking Telecom approval. Readers specifically looking for an inbuilt modem should contact DG for the latest news.

Prices

The basic unit with 256k of RAM and a single 720k disk drive sells for $4,995. An upgrade to 512k of RAM is $2,165, and an extra 720k disk drive is $1,250.

Conclusion

It's not clear where DG's target market lies, and the components vary so much in size and quality that the system sometimes feels like a large scale prototype or a market test. Perhaps Data General is looking to see which components people buy, and to discover how and where people will use them. It can then aim the DG/1 accordingly. But for now the machine offers a promising start to a line of small-size, big-job personal computer systems.

Technical specifications: Data General/One

Processor:	80C88
ROM:	32k. Contains four packages: Setup, Notebook, Terminal and Diagnostics.
RAM:	256k, expandable to 512k
Storage:	Up to two 720k 3½-inch internal drives plus an external 5¼-inch disk drive.
Keyboard:	Numeric keypad overlaid on main keyboard
Size:	Open 35cms x 30cms x 21cms. Closed 35cms x 30cms x 7cms
Weight:	Four kilograms
I/O:	Two RS232 ports and expansion bus
Bundled software:	ROM-based terminal emulator plus editor
Options:	Printer and IBM expansion chassis (able to take five IBM PC-compatible cards), $2660; Monitor/Printer/Display Adaptor, contains RGB output, parallel port and disk adaptor, approximately $660.

Hewlett-Packard 110

The Hewlett-Packard HP 110 machines show you how much can be tucked into a small package. In these portables — HP's first intended for a general-consumer rather than a business market — Hewlett-Packard has included a CMOS version of the 8086 processor, MS-DOS 2.11, a telecommunications program, a word processing program and even Lotus 1-2-3 in ROM! Notwithstanding all this, they have also 382k of ROM and an additional 272k of RAM, divided between available memory for programs and an electronic disk. The liquid crystal display (LCD) can produce graphics (including 1-2-3 graphs) and 80 columns by 16 lines of text on the standard machine.

All this is neatly tucked into a 33 by 24.5 by 7.6cms package that looks much like a little briefcase and weighs 4.5kg. The main case is made of the creamy-white plastic that corporate buyers are reported to prefer.

Just released

The range also includes the just-released Portable Plus (see news story in the last issue). This differs from the 110 in having a full 80x25 screen, and in allowing you to plug several other software programs in, including Lotus 1-2-3 and MemoMaker (which are not included in the reduced sized ROM of the Portable Plus) and Microsoft Word, all of which are extra-cost options; also the base model is equipped with only 128k of RAM — the concept of this, and the ROM with fewer programs, is to allow purchasers a greater degree of control in the configuration of the machine. Otherwise the two machines in the range are functionally the same.

Their LCD displays form the top part of the case, folding down like a lid that fits over the keyboard — but the drawback with both is that the display is difficult to read under anything but ideal conditions.

The inclusion of a screen contrast button is of little use as this simply makes the characters fainter or darker. Other portables let you adjust the angle of the crystals in the display itself so that you can usually eliminate glare and get a clear image.

You may also have difficulty with the typeface used on the 110 display, it is a trendy and sometimes confusing design which suffers considerably on the machine's inverse display.

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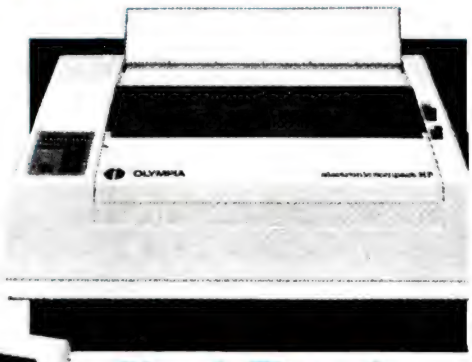

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HP 110: Shows how much can be tucked into a small package.

Selectric-style keys. Most of the nasty little keys of the IBM PC have been moved out of the way (with the unfortunate result that, in some cases, they are hard to find). Eight programmable function keys are strung along the top edge of the keyboard, along with other special function keys and the four cursor control keys. These arrow keys are in a horizontal line — an arrangement that takes some getting used to.

The keyboard generally is interesting for what it doesn't have — for example, there is no ALT key; instead, an EXTEND CHAR key performs the same type of function.

But perhaps most striking is the absence of an On/Off switch. To turn the 110 on, you just press any key, and it 'wakes up', while you exit with a function key command, which turns the computer off.

If you leave it running on its battery, the HP 110 will turn itself off after sitting idle for a length of time, which you can specify. However, if you crash the computer, as I did repeatedly, you may search in vain for a reset key. In fact, to reset you simply hold the contrast adjustment key for 15 seconds.

Power is supplied by a typical transformer which recharges an internal battery pack. When the computer first powers up, it shows you how much charge is left and if the reserve drops below a certain level, the keyboard locks up until the charge has been restored. This protects you from running the system down so far that you lose what is in memory.

When you first turn on the HP 110, it displays the time, date and a list of applications that are available. You select one by moving the arrow-shaped pointer to the function you want and then pressing RETURN. This is a big improvement over the cryptic A> that MS-DOS always greets you with.

This friendly helper is named PAM, which stands for Personal Applications Manager.

Though unequal in quality, the three applications programs that come with the HP 110 are all useful. The best is clearly 1-2-3. Since it is in ROM, it loads in less than three seconds. You can create and save worksheets and even view graphs on the screen. If you have the HP ThinkJet ink jet printer, you can get screen dumps of the graphs. Note, though, that not all of 1-2-3 is included in ROM; the programs PrintGraph, Tutorial and Utilities are supplied on a separate disk.

The Terminal program is almost as complete and easy to use as Lotus's 1-2-3. You can set up separate configuration files that will automatically set the proper protocol settings for almost as many different online services as you want.

The weakest link is certainly the word processor. Its name, MemoMaker, is a good indication that it is not intended as a serious word processing program. True, it does have the prerequisite block functions, to search, replace and control the printout's format. However, where most programs give you a number of ways to achieve a given result, MemoMaker generally offers only one. It also makes strange use of the function keys, which are hard enough to use owing to their labelling problems.

The HP 110's versatility does not stop with these three programs. It is possible to add to its facilities by importing other programs and data files to become part of the available tools resident in the machine's memory. Of the 272k RAM on the standard machine for example, you can partition off as little as 16k or as much as 176k for electronic disk storage.

Hewlett-Packard has provided three different ways to enable you to store programs and other files in memory. The most straightforward method is to attach one of HP's battery-powered 9114A disk drives, which use the Sony 3½-inch microfloppy. The drive is an extra item to buy but it makes it easy to load in programs like dBase II, Multiplan, and WordStar that third-party vendors have made available in HP 110 versions. You can have up to eight external drives.

The second way is to use a modem to download programs and data from other computers. This has its limitations, however, including low speed and possible errors in transmission across phone lines.

The third method is to use the HP Portable Desk Top Link, which is an add-on board for your desktop computer and connects via the HP Interface Loop.

An HP interface

The HP 110 peripherals connect using the HP Interface Loop (HP-IL). Both the computer and peripherals have an 'in' and an 'out' connector. First, link the computer to the printer by hooking two cables to the corresponding connector of each device. Then, to add another peripheral, simply create a loop so that the 'in' connector of the computer is attached to the 'out' connector of the printer. Attach the 'in' connector of the printer to the 'out' of the next peripheral, and continue on in this way, adding as many peripherals as you wish. The cables hook together to become their own extension cords, allowing any two devices to be joined at up to 30 feet. Adaptors for parallel printers fit easily in the loop, but the one problem is that you must turn on *all* items on the loop for the system to work properly.

Installation of the IBM board is easy: just drop it in an available slot. But if you are using a variety of other cards, you may run into a conflict over memory addresses. The Portable Desk Top Link card comes set for address 1,700 hex, but there are DIP switches that permit you to change this if necessary. Used with an IBM PC-XT with only a monochrome display adaptor, the card worked fine without a change of the settings.

You then load HPLink, a program from a disk provided by Hewlett-Packard in IBM format. One interesting feature is the fact that the entire documentation for the Desk Top Link card was provided on this disk. This interactive reference was helpful, but to gain the greatest benefit

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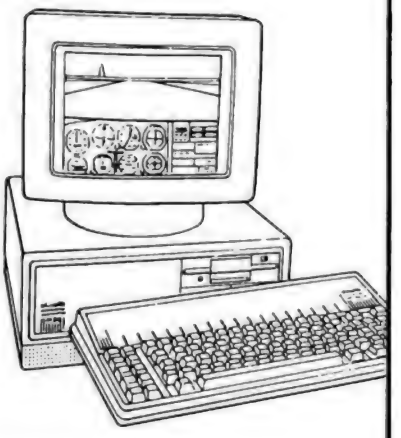

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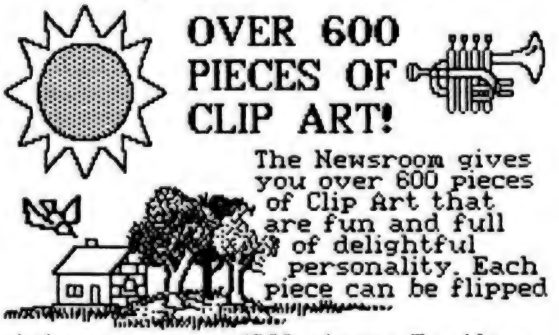

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from it you will want to print out the screens for reference as you are working with the program.

Perhaps the most useful item here is the external disk function. I was able to use the XT's hard disk as storage for the HP 110: the 110 was able to read and write to the IBM-format disks and could call for directories and run programs, just as if the disks were part of the portable.

However, the Portable Desk Top Link card was not without its snags. The online documentation fails to remind you to go back and change the system configuration file to reflect the presence of two additional drives. To further complicate matters, since the HP assigns letters to the drives in sequence, you must sidestep on the XT by using the ASSIGN command to re-route requests for drive B to drive C (the hard disk). It gets confusing, since the HP refers to the IBM first drive as drive C and the next as drive D (the hard disk on the XT). As a result, before asking to log onto a different drive, you must think twice to be certain that it is the one you want.

Unfortunately, transporting information from an IBM to the HP 110 is not as useful as it could be. In spite of being an MS-DOS machine, the HP 110 is not very IBM compatible.

Data files such as text files and Lotus worksheets transfer very nicely, and this alone could make the HP 110 a good investment. For example, a writer could use the 110 to write on while travelling and then transfer the drafts to the IBM to be edited with a more powerful word processor. Or sales staff could develop Lotus worksheets on an IBM and then copy them into the 110 for sales calls. With the ThinkJet printer along, variations could be quickly dumped onto paper, including graphs.

If programs are what you want, however, the plot thickens. The processors are different, the screen display is different and, internally, there are many more differences between the IBM and the HP 110. We tried loading and running a variety of IBM programs on the 110, and vice versa, to no avail. You need different versions of given programs to work on either machine.

The printer option allows you to route printouts to the printer attached to your PC. This could be a useful feature, since it means that you would not have to purchase another printer or interface item for your system. But the screen option is quite disappointing, since it merely uses the IBM screen as a printer, scrolling the text on the screen instead of on paper. It is *not* the equivalent of an external terminal for the 110.

Prices

The 16 line HP Portable retails for $5,300 and includes 272k of RAM (including the electronic disk) and 384k of ROM; the 25 line machine with 128k of RAM and 192k of ROM sells for $4,927. Additional RAM is available for $1,065 per 128k. The battery powered disk drive costs $1,540 and the ThinkJet printer is $1,045.

A landmark

For all of its problems and quirks, the HP 110 is a triumph and an important step in the development of a truly useful and portable computer. Its bundled software and more than half a megabyte of combined RAM and ROM make it a reasonable buy. The clever interface design and rechargeable batteries are icing on the cake.

On the other hand, both the keyboard and the LCD display pose problems. The availability of programs is a small issue, since many of the big-name products appear to be on the market. However, since only the data files are interchangeable, you will have to plan on buying new versions of your existing IBM programs if you want to have them up and running on the HP 110.

The HP 110 is perfect for some people. If you need to carry data files around and work on them away from your desktop machine, then this machine has some important advantages for you. But, you must keep in mind that you'll still probably want to use a bigger machine when it comes to any storage and complex processing work.

The rest of us should remember that this is only one of the first MS-DOS battery-operated portables.

Technical specifications: HP Portable Plus

Processor:	80C86
ROM:	192k; contains MS-DOS, Terminal Emulation Package, Personal Applications Manager and HP-Link
RAM:	128k (up to 896k), with facility for using part as RAM disk.
Storage:	No internal disk drive. RAM disk only.
Keyboard:	Bears little resemblance to IBM PC keyboard; compatible with that of HP 150. Numeric keyboard overlaid on main keyboard.
Size:	Closed 33cms x 24.5cms x 7.6cms. Its height when opened varies between 14 and 26cms depending on selected screen angle.
Weight:	4.5kg
I/O:	Serial port and HP-IL link
Bundled Software:	Refer 'ROM'
Options:	HP 9114A battery-powered external disk drive (uses 3½-inch disks), $1540; ThinkJet battery-powered ink jet printer, $1045, Microsoft Word, MemoMaker, Time-Manager and Lotus 1-2-3 are available on plug-in cartridge.

Toshiba T1100

Adam Osborne has a lot to answer for. When he launched his 'portable' computer on an unsuspecting world, he kindled the imagination of a thousand computer designers in a hundred companies. Here was a new quest — to make a personal computer that offered power and portability. Toshiba decided to have a go in March 1984, and the result of its efforts is sitting on my lap. It is $2,995 worth of portable PC-compatibility, a truly personal computer that excites all who see it. The T1100 is, without a doubt, one of the most desirable portables to hit the streets.

Hardware

Companies such as Data General and Hewlett-Packard have set the standards for portables. Toshiba follows in their footsteps. It has managed to pack a 256k, 16-bit MS-DOS compatible micro, an 80 column, 25 line liquid crystal display and a 3½ inch disk drive into a cream-coloured package measuring 31.1 x 6.6 x 30.5cm and weighing just 4.1kg. It will fit an average briefcase and you won't get drooped shoulders carrying it.

Internal, NiCad cells give approximately eight hours use per charge. MS-DOS 2.1 comes in the package and the whole lot will leave a few dollars change out of $3,000.

It always amazes me how designers

T1100: one of the most desirable portables.

can get a desktop computer into a briefcase. In the case of the T1100, you get just two short expansion slots. A 3½ inch disk drive is obviously less space-consuming than a 5¼ inch drive, and the keyboard has been cut down to size, without losing any of the 83 keys you find on the PC.

Inside there has been some clever work, mainly to get power consumption down. All components, except the DRAM memories, are CMOS, and consume a total of just one watt of power. The disk drive uses only 50mA. The main processor is a CMOS 16-bit 80C88. Three specially developed gate arrays are used to cut down on the number of discrete components. There is a 3,900-gate 82C37 DMA controller, a 2,600-gate 82C53 bus controller and a 900-gate 82C59 interrupt controller. The batteries can be recharged over 1000 times.

Good looking, quality construction materials are used too. The development team conducted severe drop tests to prove this. I tried a few myself too, and can testify the Toshiba is tough. The case does mark rather easily though.

There is no handle, annoying if you want to carry the T1100 around. The solution to this and a dirty computer is a $50 T1100 bag.

With the lid closed, all you see is an on/off switch, the LCD contrast wheel, disk drive slot and ports on the back for the AC adaptor, RGB and composite video, parallel printer and external disk drive. There are two other switches too, to switch between LCD and CRT display and to set external or internal drives as drive A.

The screen hinges down over the keyboard and is held securely shut by two red latches. It folds back through up to 180 degrees.

The LCD display is not backlit but the aspect ratio can be adjusted to give a clearer display. The display area measures 23 x 15cm — that's quite large enough for well lit environments. Maximum resolution is 640 x 200. Still, LCD is far from being an ideal display medium. Electro-luminescent and gas plasma displays are prohibitively expensive. CRT is still the best compromise between price and usability.

So, what has Toshiba done? It has put both a composite video and a nine pin RGB port on the back of the T1100. If the T1100 is being used on a desk, plug a monitor in, turn off the LCD display and you have a desktop PC compatible. That's neat.

From power on to the end of memory check takes around 20 seconds. Loading the operating system takes another ten seconds. There is no auto power off, though if the batteries get low, a red warning light comes on, indicating you have twenty minutes usage left. Recharging takes eight hours; the T1100 can be used while it is recharging.

The keyboard is a squashed version of the IBM board. Alphanumeric keys are in off white, numeric keypad, function and control keys in fawny grey. The arrangement is squarer than that of a desktop compatible.

Function keys are on the top left of the main key area, instead of to the left. The numeric keypad keys are on the top right, rather than the right. This latter arrangement does not work very well either for entering numeric data or using the cursor control keys. If you are used to a PC keyboard, you'll need to re-educate your fingers a little to use the Toshiba. However, as the overall result is a commendable saving in space, the new arrangement must be accepted.

The only real problem would come if you are using keyboard overlays — an increasingly common feature of sophisticated PC programs. That's part of the price of portability.

As keyboards go, the Toshiba's is quite pleasant. The keys are close enough for touch typing, have a positive feel and are clearly marked. The enter key is large enough to find in a hurry and the relocation of the / and ' keys next to the space bar is no handicap. If anything, the keyboard is rather too flat, there is no caps lock light and the overall feel is a little synthetic. Maybe that's to do with the empty sound the keys make when depressed.

Toshiba has included a test utility on the system disk. This checks the system, memory, character sets and attributes, display modes, disk and printer. That could save Toshiba's dealers from unnecessary phone calls, as the user should be able to establish if the unit is faulty by running this program.

Documentation is perfectly adequate. The owner's manual explains how to set up the T1100, the fundamentals of disk care, a little on MS-DOS and what peripherals are available. The MS-DOS reference manual is a standard user manual on the system, with plenty of detail and great for insomniacs. If you are new to MS-DOS, you'll be shopping for other reading material.

Software

On the left of the unit is the 3½ inch disk drive. The disks are double-sided, holding one megabyte unformatted and 720k formatted. A yellow light on the keyboard and a red light above the disk light up when the disk is being accessed. You'll hear a graunching sound when this is happening too!

There's no doubt that 3½ inch disks are the way of the future. They are smaller and tougher than 5¼ inch disks, as well as holding more data. For a portable system, they are a logical choice.

There is only one slight problem at the moment. Getting your favourite PC program on 3½ inch disks is not as simple

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The HR 39 and HR 134 Monochrome Monitors are direct replacements for the IBM Model 5151 Monochrome Display. The HR 39 features a GREEN phosphor screen, while the HR 134 an AMBER screen. Both monitors plug into the IBM Monochrome Display and Printer Adaptor (or compatible) card.

The HR31 200 Colour Monitor is a direct replacement for the IBM Colour Display. It plugs into the IBM Colour/Graphics Adaptor (or compatible) card. The HR31 200 features **0.31mm dot pitch and a black matrix picture tube.** This special tube reduces glare and enhances RGB colour to ensure superb picture quality.

All three monitors include a tilt and swivel base. Use your Qubie' monitor as you would the IBM ; it will in no way affect the normal use or function of your Personal Computer.

Technical Data - HR31 200

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Tube:	Black Matrix
Sync-H. Scan Frequency:	15.7kHz
V. Scan Frequency:	60Hz
Signal Type:	RGB I. TTL Level Positive Sync H/V. TTL Level Positive
Display Size (H x V):	245mm x 170mm
Retrace Time (H x V):	0.5Ms x 0.4msec
Resolution:	640 x 200 lines
Input Terminals:	9 pin "D" type connector
Dimensions:	11"(H) x 15"(W) x 13"(D) 256(H) x 367(W) x 316(D)mm
Shipping Weight:	15.9kg

Model HR31 200

Models HR 39 & HR 134

Technical Data - HR 39 & HR 134

CRT Size:	12" Diagonal (29cm)
Phosphor:	HR 39 (Green); HR 134 (Amber)
Sync-H. Scan Frequency:	18.432kHz
V. Scan Frequency:	50/60Hz
Signal Input:	Video - TTL Level Positive Sync. H - TTL Level Positive Sync. V - TTL Level Negative
Video Response:	20MHz
Display Size (H x V):	203mm x 135mm
Display Time (H x V):	44Ms x 18.99msec
Resolution:	Centre 1,000 lines Corner 800 lines
Display Formats:	9 x 14 matrix, 2000 characters in 80 x 25 format
Input Terminals:	9 pin "D" type connector
Dimensions:	10.5"(H) x 15"(W) x 12"(D) 257(H) x 367(W) x 294(D)mm
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as it might seem. 5¼ inch disks are norm, and will be for some time yet.

Solution one is to hassle distributors. Most will make 3½ inch disk format versions of their software available. Good dealers may even stock 3½ inch disk varieties of top sellers.

Toshiba (Australia) Pty Ltd told me that they were aiming the T1100 chiefly at the person who already has a desktop PC. If that's the case, solution two is to simply port software across to a 3½ inch disk in the Toshiba. You will need CopyIIPC for programs such as Super Calc 3, PFS:file and Flight Simulator. Diskcopy will manage programs such as WordStar, Multimate and Basic. If you want to transport Lotus 1-2-3, Framework, Symphony or dBase III, you're stuck. You will also need an RS232 port on the Toshiba. That only comes as an after-purchase extra.

Solution three is to invest $879 in Toshiba's 5¼ inch disk drive, and run the 5¼ inch version of the program. A second disk drive makes a lot of sense, as it saves disk changing and, in any case, many programs need two disks to operate correctly. Toshiba have an external 3½ inch disk drive available too, costing $829.

Most programs that run on a PC also run on the T1100. You may need a colour monitor for some of the features, but that option is available via the RGB port. I've mentioned the keyboard overlay problem — the keyboard also causes tangled fingers on games such as Flight Simulator and PC-Man. In general, compatibility is not a problem.

On the bench, the T1100 is not much slower than a standard PC compatible — not slow enough at any rate to cause concern. It is an efficient little computer.

Peripherals

Mention has been made of the accessory mains powered disk drives. At least one is essential if you want to use all PC software to its best advantage. Another option is to upgrade the memory from 256k to 512k, adding 256k of costly CMOS RAM at a cost of $649. If it is just storage capacity you are after, and you want to be able to operate away from the mains, this is an excellent option to have.

If there is any shortcoming on the basic T1100, it is the omission of an RS232 port. AN RS232 card is essential if you are to communicate with the outside world. The card, made by GEC, will be available any week now at a cost of $165. It will have 300 Baud and Viatel protocols built in plus smart features such as autodial.

Conclusion

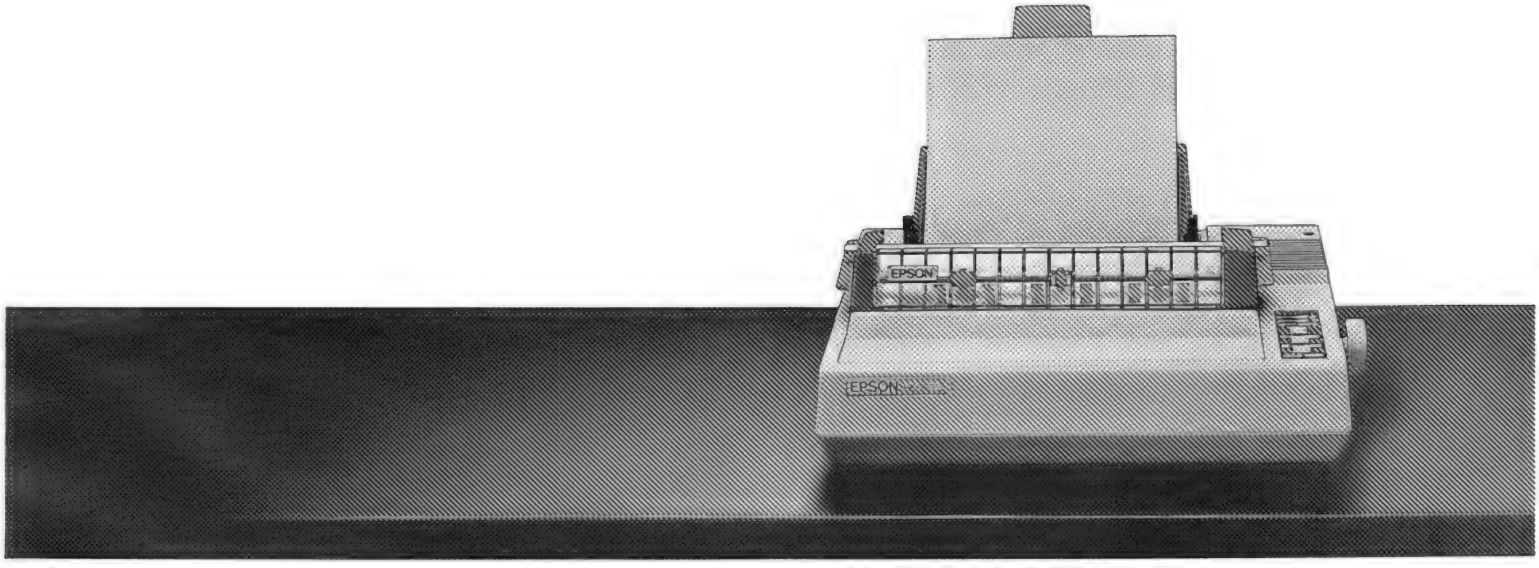
At $2,995, the Toshiba T1100 is an excellent portable PC computer. It is well constructed, highly compatible and can be used with a monitor. However, to really get the most from it, you need at least the RS232 card and either access to a desk top PC or the 5¼ inch disk drive. In that case, it is an ideal adjunct to the desktop PC, and, with a monitor, could even replace it.

As a primary PC, software may be a problem. Dick Smith is selling the T1100 bundled with the Access Four text editor/spreadsheet/desktop utilities program, worth $700. That's a start. A monitor, RS232 port and 5¼ inch disk drive would give you a $4,500 package that offered the best of both desktop and portable worlds. With versatility such as that, the Toshiba T1100 is hard to beat.

END

Technical specifications: Toshiba T1100

Processor:	CMOS 80C88
RAM:	256k
Mass Storage:	Single 720k (formatted) 3½ inch double sided disk drive
Keyboard:	83 keys, IBM PC compatible
Size:	31.1 x 6.6 x 30.5cms
Weight:	4.1kg
I/O:	Two short expansion slots, parallel printer port, RBG and CV ports, disk drive port
DOS:	MS-DOS Version 2.11
Peripherals:	5¼ inch disk drive, 3½ inch disk drive, RS232 board, 256k CMOS RAM, bag



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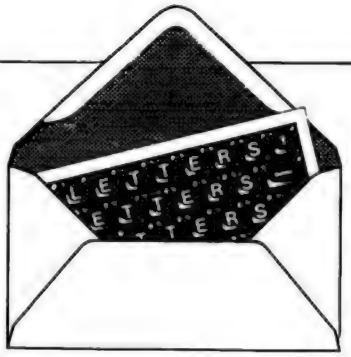

LETTERS

This is the chance to air your views — mail to 'Letters', Australian Personal Computer, 2nd Floor, 215 Clarence Street, Sydney 2000. Please be as brief as possible and add 'not for publication' if your letter is to be kept private.

Take a tip

I read with interest your article in the August issue 'Fatten up your Mac'. I have already upgraded my Mac to 512k through the official Apple route, but would like to pass on a few tips to those readers who may still be considering a DIY upgrade.

Firstly, there is talk on the bulletin boards that Apple is about to issue a 128k ROM upgrade. No-one knows for sure what it contains, but guesses are that it will include the Finder. Rumour also has it that Apple will be doing the upgrades with a straight swap of the motherboard (as with its 512k upgrade), and that it will not accept boards that have been tampered with (not surprisingly). Having said that, the ROM chip is socketed, and DIYers *may* be able to buy and install it themselves.

Secondly, readers should be warned that the Mac motherboard is a four-layer board and can be damaged by excessive heat. I understand that you may be able to buy 128k boards from dealers who do the official Apple 512k upgrade. Apparently, Apple buy the old 128k boards back from the dealer, so if you offer the dealer the same or a slightly higher price for it, you may be able to get a board to practise on. The price Apple pays the dealer is about $350, which is much cheaper than ruining a Mac.

Of course, if Apple were to charge a reasonable price for its upgrade, this messing about would not be necessary.
S Wathanasin

Bludners

The Microsoft Basic Compressor program in August's Program File has a minor mistake in lines 800, 830, 860 and 950. In these lines, a strange symbol that looks like a slashed 0 appears. This should be a backslash symbol, standing for 'integer division'.

In the same issue, the instructions for the Turboload 64 program for the Commodore 64 with 1541 disk drive should have included the fact that the program will not work with Simon's Basic, nor will it work correctly if another serial device such as a printer is attached and switched on. This is because the program alters the way the computer handles the RS232 interface, and so cannot cope with other peripherals attached to this interface and switched on.

And, finally, our apologies to Magnabiz Systems for referring to its product as an "ultra-simple cashbook program" in the introduction to last months screentest. It is easy to use, but its facilities are more extensive than a cashbook package. Magnabiz is a simple accounting package for small businesses.

Ug's bugs

Your correspondence on the origin of the word 'bug' seems to be flagging, so I thought I'd offer my contribution.

The word is in fact prehistoric. It can be read in Carlyon's *Prehistory* (vol XIX, p 239):

'Thus Ug, son of Ug, decided to invent the wheel and, after experimenting with various materials, cut a disk of oak and punched a hole through the centre. He then mounted the wheel on his bedroom wall to keep it safe so he could tell his grandchildren how clever he was. As he was hanging it up, a weevil decided that string might be nice for a change, and the wheel fell from its position onto Ug's foot. I the resulting exclamation, Ug invented several words, one of which was 'bug', and this has been used ever since to describe both insects and cock-ups.'
L. Carlyon

Tandy and Apricot Cobol

About a year ago I had access to a Tandy Model 4 which has a Z80 processor and uses the CP/M operating system. I purchased a copy of the RMCobol compiler and a runtime diskette.

I have now purchased an Apricot PC. I knew that I would not be able to slot my RMCobol compiler diskette into my Apricot PC and use it efficiently, due to the different processors. Programs can be transferred between the different diskette sizes.

Can I use my RMCobol compiler to write and run Cobol programs on my Apricot PC? Can I use the programs written with the Tandy machine on the Apricot?
I Bawa

The disk for the Tandy contains a program which translates from Ryan-McFarland Cobol into Z80 machine code. Your Apricot expects programs written in 8086 machine code, which is very different from Z80 machine code.

Programs to convert Z80 code into 8086 code do exist. (Microsoft's Basic interpreter was translated using such a program) but the task is difficult. Translated programs are generally much slower and longer than those written in the correct code initially. The translator will not be able to cope if the original program contains references to hardware which is not present in the final machine.

Another problem with machine translation is that it makes error diagnosis very difficult. Imagine writing a book in English and then translating it into Greek, armed only with an English-Polish dictionary and a Polish-Greek dictionary. In this case, Z80 code is the equivalent of Polish. Errors multiply and become increasingly hard to correct if you have to go through an intermediate language.

The XLT86 code translator is available, but is really a product aimed at software houses rather than business users.

Rather than buy a translator for compiled programs, I'd advise you to buy a new Cobol compiler for your Apricot and recompile your original 'source' programs.

Two Cobol compilers are recommended — Microsoft Cobol and CIS Level 2 Cobol. Both of these are expensive. You should not have any major difficulty converting your RMCobol programs to suit the other compilers, although you may have to read the manuals quite carefully if you've used obscure

features of the language.
SG

The art of programming slowly

Recently I bought the first three volumes in the series *The Art of Computer Programming*. What has happened to the other four volumes in the series? Although the preface to the first volume suggests that the author finished writing all seven volumes in 1967, the third was only published in 1973. Do you know if and when the remaining volumes will be published?
G Hjaltson.

The publisher Addison Wesley says that work on the series is still taking place, and it hopes to release volume four some time in 1986.

Donald Knuth, the author, seems to have become the victim of his own success with this series. The first brilliant and exceptionally comprehensive volumes have set a very high standard for the rest.

In 1967 the computer industry was barely 20 years old, and a comprehensive programming guide may have seemed feasible. Since then, computing has advanced at such a rate that it is difficult to keep a monthly magazine up-to-date, let alone a series of books. It's hard to see how Knuth can encapsulate the rest of computing knowledge in four volumes.
SG

Standard links

Why isn't there a modulator that will let a tape recorder be hung onto the serial port of a micro, either to receive or transmit? All my micros have a serial port of one type or another, so I could transfer the data between the machines without having to worry about compatibility. Surely someone could work out the electronics and *APC* could publish it as a project. After all, it would be compatible with all machines.
P Hickman

In theory this is possible, but in practice it is fraught with difficulty. The snag is that there are many ways of wiring so-called 'compatible' equipment together. You must take account of the 'handshaking' (the way machines warn each other that they are busy) and a wide variety of machine-specific quirks. If everything is set correctly, you can get two computers to talk to one another, but, if anything is wrong, the system probably won't work at all.

Many computers are sold without the technical information needed for you to make a connection. Often this hides the fact that a 'standard RS232' interface is almost totally non-standard — it might drive a printer, but you shouldn't necessarily expect it to do anything else. Built-in RS232 interfaces on home computers are worst in this respect.

Incompatibility seems to be the name of the game with RS232 interfaces, but problems don't stop with the hardware. For example, different micros use different characters to mark the end of lines — most use the usual CHR$(13) while some follow the Unix convention and use CHR$(10). If you've some programming ability, it can often be worth connecting small computers via game ports rather than an RS232, POKEing data back and forth.
SG

Wrong Knowledge

I was pleased to see your article 'In the know', published in *APC*, May 1985. Thank you for mentioning the Dialog Information Retrieval Service.

I would like to comment on two matters:

Page 36 — the problem of double characters is overcome by using full duplex instead of half duplex.

And page 41 — Dialog's Knowledge Index is not currently available in Australia. K1 is available in the US at $US25 per connect hour, which includes telecommunications charges. At present telecommunications charges to connect to Dialog from Australia average $A20-30 per connect hour, and hence there is no way we can offer access to Dialog's Knowledge Index from Australia at the above rate.

On another matter, you will be interested to learn that in January 1986 two very important events in the online scene will take place in Sydney.

Information Online 86, the first online conference in the southern hemisphere, will be held at the Hilton International Hotel January 20-22. You can contact the organizers c/- Australia Convention Management Services, on (02) 29 1431.

On January 18 we will hold the first southern hemisphere Dialog Update, at the Manly Pacific International Hotel. At this conference, Dialog users are informed about forthcoming developments and cost-effective searching tips.

Amiga's target

Having read the exciting revelations in Guy Kewney's Benchtest of the Amiga, I was surprised at his final conclusion that "the Amiga . . . is obviously going to be a business machine first and foremost". Apart from the price, the Amiga would seem to be much nearer to Kewney's description of the ideal home micro for which "We're still wailing" (Newsprint, February 1985), with ample RAM and multi-tasking.

I think that features such as graphics animation and sound synthesisers are likely to be of little interest to the majority of business users. I also doubt that businessmen will rush to invest in a machine with a virtually unknown operating system and, so far, very little in the way of applications software. In fact the Atari 520ST with its GEM interface would appear to be a better business investment.

Commodore should target the Amiga at the home computer market where its obvious appeal as a sophisticated games micro would guarantee it success.

Finally, why didn't you get any benchmark tests on the Atari 520ST?
R Thorpe

Personal Basic was not fully configured to the prototype 520ST used in the Benchtest — Ed

Self assessment

I expect that Ted Barker would have been pleased with R Quinn's comments about the VZ-200 database (*APC* July 85) unkind as they may have been, on the premise that any comment is better than none. The main reason for submitting programs for publication must be the hope of getting some feedback, which would suggest improvements. Expectation of financial gain must rate very low: if and when the publication fee is received, generally many months after submission, it does not cover much more than the actual cost of preparing the program for submission.

I would like to suggest that users of published programs voluntarily contribute to the authors a sum based on whatever the program is worth to them. I think this would be an incentive to produce better programs.

As an example, I would gladly send $5 to J Coyne (Amstrad See PC, *APC*

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June); I would value it at $10 if it had been renumbered, if I had not had to rewrite his machine language to make it relocatable (to allow for merging), and to provide an optional output to printer.

I hope that you will publish this suggestion and any readers' reactions to it.
P Lukes

Comments please — Ed

Digit disasters

Regarding your "Dial carefully" entreaty in the September issue of *APC*, page 169, I have to reply

The correct number is the first one, ie 2559146 (confirmed in the Adelaide white pages). There's nothing we can do but plead guilty. Mea Culpa — Ed

'Proofread carefully'!
VIZ APC September 1984, page 154, Computer Ventures 2559146
APC September 1985, page 170 Computer Ventures 2551946

Obviously, a careless transposition of 2 digits at your end is going to result in a lot more incorrect dialings than the individual communicator is going to make, even late at night.
P Guthrie

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Data dictionaries

There's no need to have badly-structured programs with randomly-scattered data — Jim McCartney explains how to create data dictionaries in MBasic and MS-DOS.

When you are writing applications programs, a lot of space is taken up in defining the data you are using, and specifying its exact relevance to the program. Each field you enter via the keyboard has to be at a definite place onscreen, has to be a particular length, and needs a type definition: for example, whether it is a string, a floating-point number, a logical integer, and so on.

In a badly-structured program, such as it is all too easy to write in Basic, this data about data can end up scattered all over the program and make things very difficult to amend. In a well-structured program, it should at least all be gathered together in one place.

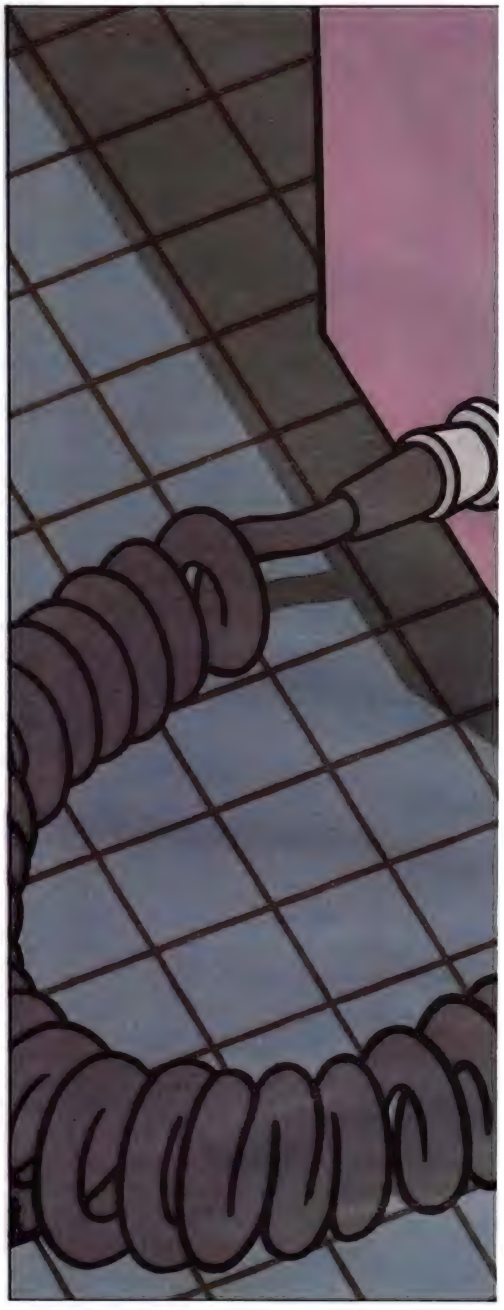
But even if your data about data (I'll call this 'meta-data' for short) is in one place, you still need program space to assign values to the parameters in order that each value takes up space twice, once in the program (for example, under Basic in a data statement) and once in the variable memory location. A second disadvantage is that if you need to change your meta-data, then the program needs changing, too. This is particularly annoying if your programs are compiled.

A simple solution to this problem is to store all the meta-data outside the program in an ordinary text file, where it can be easily accessed with a text editor; your program then reads the meta-data in from the text file. When you have defined your meta-data thoroughly enough, you can use the same program over and over again for different applications, simply by reading in a different text file. For example, you only ever need to write one single file maintenance program and use it for any job. This article will give you basic experience of setting up these text files and what needs to go into them. These files of meta-data are known as 'data dictionaries'.

Most of you who are familiar with data dictionaries will associate them with the more substantial minicomputers, and will not consider it a subject for low-level hackers. But as will be shown here, it is in fact quick and easy to produce and use a data dictionary system with any reasonable text or word processor — ED or EDLIN will do very well — and to use it to configure standard program modules to handle a wide variety of tasks in as many formats as you wish. If you want to use several files in a program, you use one dictionary for each file. If you want to use the same file in different ways in different programs, edit the data dictionary to produce a variant on the original. The dictionary principle can be extended to screen displays, menus and print formatting.

In the implementation I'll describe here, dictionaries are held in simple text files, and read into a series of arrays which may contain data relating to several concurrent files. Text file dictionaries can, of course, be immediately printed out for documentation.

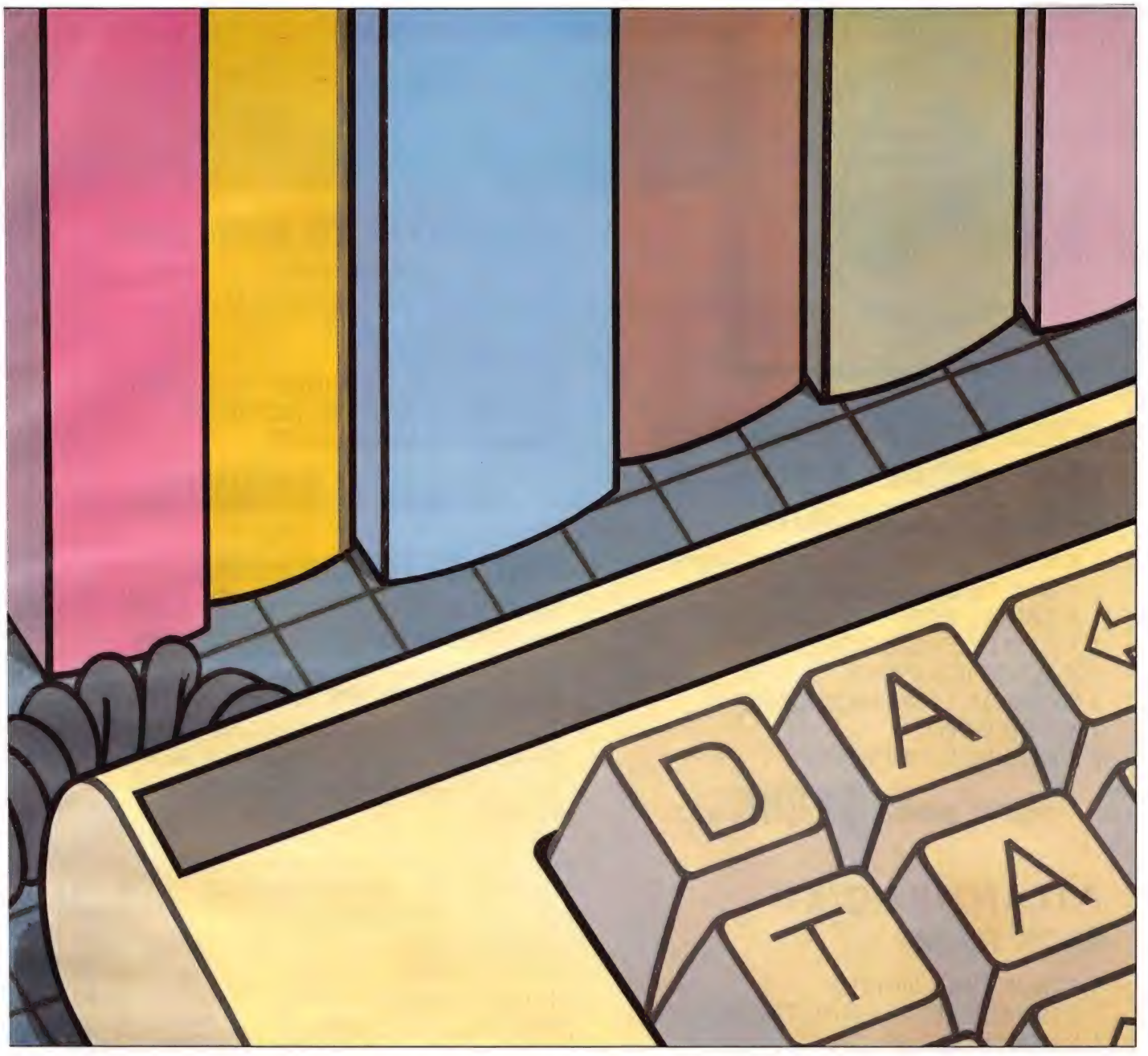
The language in which you implement it is not important, and likewise any DOS will suffice. My examples are for MS-BASIC and MS-DOS, but I want to explain a principle rather than present lots of code. When you understand it thoroughly, you will have taken an important step on the way to your very own applications generator.



First steps

The first thing you have to do is write a file maintenance program in a sensible and structured fashion, either with or without an indexing system. Readers who have not written such a program should read on regardless — there is much relevant matter about the nature of data to be found in this short article. If you have written a file maintenance program, you should find that the data about the data has accumulated more or less in one place. If it hasn't, work on it till it does.

Each data filed will have a vertical and horizontal coordinate (HOME = 1,1) which are called V%( ) and H%( ) — elements of an integer array. Each field will have a maximum length, L%( ). The screen layout will be associated with pro-



mpts which can be expressed as PR$( ), which start at locations PV%( ) and PH%( ).

The data which is held in the arrays is called 'parameters'. A parameter is a variable which is held constant in a particular application, but may be changed for a different application.

Draw all this on screen layout paper and assign a value to everything you want in your file or that is to be displayed at any time. Ignore any standard screen headers or regular message lines — the bottom line is usually reserved for messages. At this point, you may find that you have fields in your file that you don't want displayed or input, and there may be other input fields that you don't want to file, but I'll deal with these later. In the simplest case, all fields will be input from the keyboard, displayed and filed, so number your fields in sequence accordingly and write down the data from your layout paper in a tidy tabulation.

Your program will deal with different types of data in different ways, according to how it is displayed, validated and filed. Therefore, define a variable T%( ) which will flag each piece of data through the program according to its type. I use the following types regularly:

1) Floating-point number (8-byte)
2) Logical integer (−32766 to 32767)
3) Date
4) 1-byte numbers (0 to 255)
5) Binary fields (Yes = 1, N = 0)
6) Strings
7) Any number filed in string format
8) A key for a record in the file being maintained
9) A key for a record to be read from another file
10) Any field requiring special validation
11) Field to be transferred between files

This covers most needs, but make up your own to suit your program — there's no shortage of numbers.

Validation

Your program will have validation procedures following logically from the keyboard input procedure. The first task of T%( ) is to flag your data to the right validation, but you need more meta data. The most common needs are for a lower and upper numerical limit, and for a warning to appear on the message line if

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the data is outside the limits. Call these LL( ), UL( ) and WN$( ). For example, for the prompt 'Age of employee' we might expect:

LL( ) = 16, UL( ) = 65, WN$ = "Age 16 to 65 please"

If the operator then enters 120 he will get a beep and a polite message, and the cursor will be stuck on the age field.

Strings only need a lower limit (minimum acceptable length); the upper length limit is already defined by L%( ).

Key fields for an index need special treatment; if you are reading, validation should ascertain whether they exist, and if not, return the next one in key order. If you are adding a record, validation must ensure that the key doesn't exist already.

Dates are usually irritating, but you can boil them down to integers for filing, expressed for example as the years after 1980 multiplied by 1000 plus the number of days into that year. The coding for validation and reduction to integers is a useful exercise for beginners.

Special validations are those which particularly depend on previous input fields: for example, the upper limit of an employee's age might depend on whether the person was M or F. (M/F fields are another useful type if you are dealing with personnel.)

Numeric data needs to be rounded to a specified number of decimal places and put into string form, right-justified, for easy handling. A subroutine to do this needs to know the number of decimal places.

Call this D%( ). This parameter is not much use except for numbers, so I use it in data types 9 and 11 to specify the file number to read and the field number to use respectively. If you are tidy-minded, you may wish to use another parameter for this purpose, but this only wastes array space. For example, if T%( ) = 1 and D%( ) = 2, you are dealing with a floating-point number expressed to two decimal places. But if T%( ) = 11 and D%( ) = 3, the data in field 3 has to be reproduced in field 11. This is useful for organising a printout, or when preparing for arithmetical functions.

It is often useful to have a default value ready onscreen in order that you only need to press RETURN to accept the given value. The default may be data which has already been read, as in the case where you are changing a record, but in other instances it is constant. The default value may be expressed as a string DE$( ). One very useful default is the system date; this may be called, for example, by a '*' in the DE$( ) parameter:

```
IF DE$(J%) = "*" THEN DE$(J%) = DATE$
```

File bit 3	Display bit 2	Input bit 1	P%( )
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

Fig 1 A process for producing invoices

Three particular processes are both necessary and sufficient, and combining these gives eight values to the parameter P%( ), ranging from 0 to 7.

The processes are:

INPUT FROM KEYBOARD — a field is either input from the keyboard or it isn't. Fields which are not input are, for example, calculations done on previously input fields, and fields read from reference files.

DISPLAY ON SCREEN — fields read from reference files need not all be displayed.

FILE ON DISK — you may have input fields which are not filed as part of the record, for example the record number if you are not using a key.

Another example is when you are producing invoices. You input the customer key, which is displayed and filed with your invoice record. But you want to see the customer name onscreen; this is neither input from the screen nor filed with the invoice record. The customer's balance may need to be read and referred to in the program, but is neither input, displayed nor filed with the invoice. The link to the invoice file from the customer file is neither input nor displayed, but needs to be filed back with the customer, and so on.

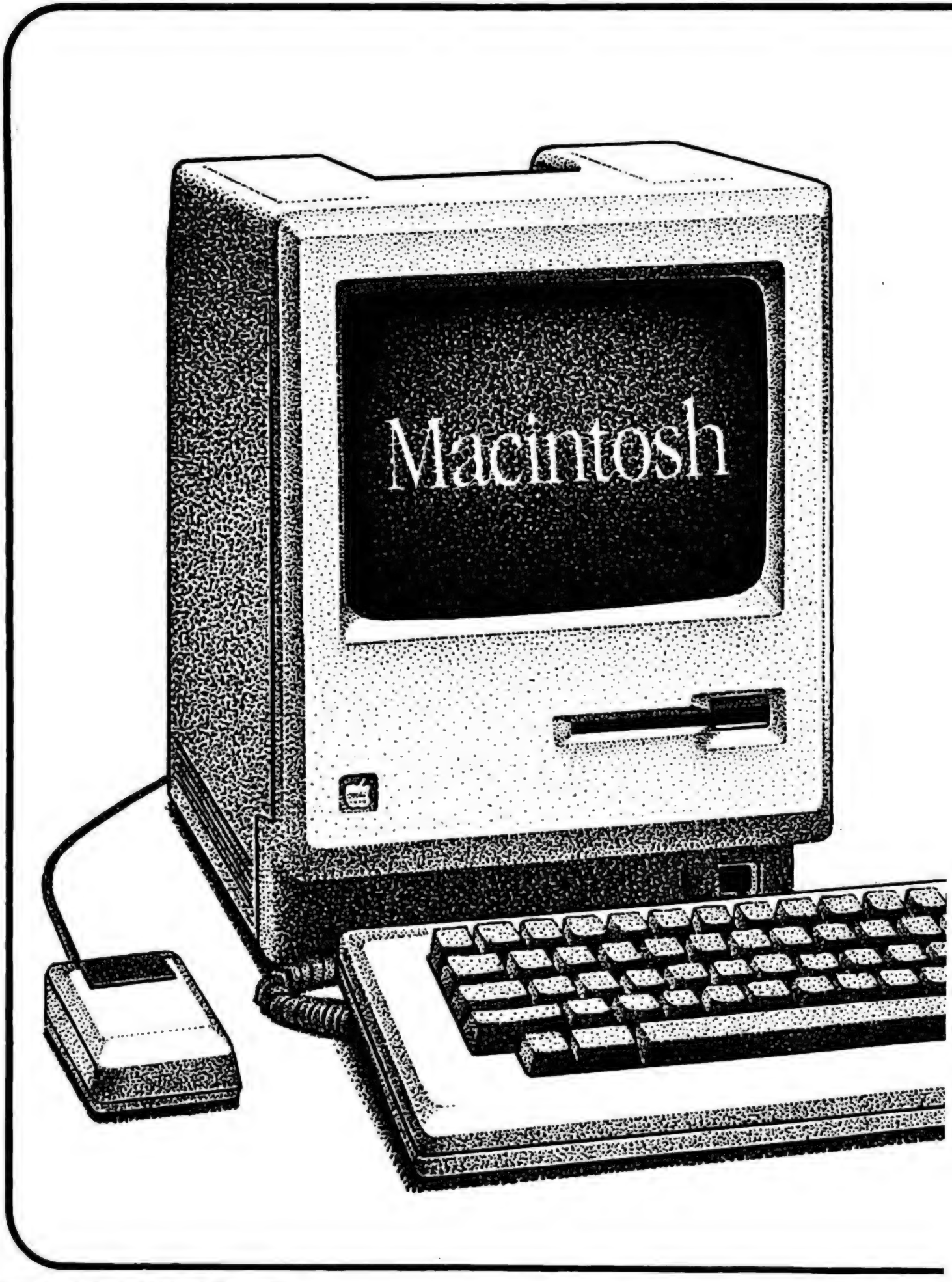
```
Data Dictionary DEMO.DIC
DEMO.DAT,4,DEMO.IND
KEY,7,30          6,7,43,8,7,3,0,0,      ,At least three letters long
DATE,9,30         6,9,43,3,7,0,0,0,      *,Invalid date. Use DDMMYY
AMOUNT,11,30,     9,11,43,1,7,0,10000,2, ,0 to 10000 please
NUMBER,13,30,     3,13,43,2,7,0,500,0,   ,0 to 500 please
```

Fig 2 Putting parameters into a text file using a text editor

```
500 IFE%>1%THEN SF%(E%) = EF%(E%-1%) + 1% ELSE SF%(E%) = 1%
510 OPEN "I",#12, DIC$                  REM DIC$ is name of dictionary
520 LINE INPUT #12,Q$                   REM discard the title line
530 INPUT#12, FL$(E%),Q%,IX$(E%)
540 EF%(E%) = SF%(E%)+Q%-1%:
    DR% = 0%                            REM DR% for record length

550 FOR J%=SF%(E%) TO EF(E%):
    INPUT #12,  PR$(J%),        PV%(J%),        PH%(J%),
                L%(J%),         V%(J%),         H%(J%),
                T%(J%),         P%(J%),         LL%(J%),UL%(J%),
                D%(J%),         DE$(J%),        WN$(J%)
560 IF P%(J%) < 4% THEN F%=0%: GOTO 580
570 T% = T% (J%):
    IF T% > 5 THEN F% = L%(J%)                  ELSE
    IF T% = 5 THEN F% = 1                       ELSE
    IF T% = 4 THEN F% = 2                       ELSE
    IF T% = 3 THEN F% = 2                       ELSE
    IF T% = 2 THEN F% = 4                       ELSE
    IF T% = 1 THEN F% = 8
    REM F% is the field length needed for each data type
580 F%(J%) = F%: DR% = DR% + F%
    NEXT J%: CLOSE 12
600 OPEN "R", #E%, FL$(E%), DR%
610 DR% = 0:
    FOR J% = SF%(E%) TO EF%(E%):
            F% = F%(J%):
            IF F% = 0 THEN 630
620         FIELD #E%, DR% AS X$, F% AS F$(J%):
            DR% = DR% + F%
630 NEXT J%
    REM Open and field the file according to data types
```

Fig 3 Procedure to read a dictionary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A handy scheme is shown in Fig 1. You can now use Boolean flags as follows:
If (P%( ) AND 1%) THEN (input)
If (P%( ) AND 2%) THEN (display)
If (P%( ) AND 4%) THEN (file it)

Having decided exactly what you want to do with your data, and (preferably) how your program is going to use the parameters, you can now put the parameters into a simple text file using your text editor. An example is shown in Fig 2.

The first line is simply an identifier. The second line gives the file to access, the number of lines to follow (one for each field), and the name of the index to be used. The following lines give the parameters, reading from left to right: PR$( ),PV%( ),PH%( ),L%( ),V%( ),H%( ), T%( ),P%( ),LL( ),UL( ), DP%( ),DE$( ), W N$( ).
These are separated by commas, and where necessary for legibility, tabs or spaces.

You will need, in addition, the arrays:
IN$( ) — to hold the data in string form in memory, after being input or read from a file.
F%( ) — will be the field length of each field in each file.
F$( ) — will be the field data as it is written to or read from the file

Reading the dictionary

Any dictionary will belong to a specific file, and as you are likely to be using more than one file, it is necessary to use at least as many dictionary files. It follows that you cannot simply read the dictionary data into an array starting at array (1) for field (1), but instead, you must arrange to read the dictionary into the first free array space.

This means that you have to specify the logical file numbers to be used. The file number is specified by the variable E%. Then you need to know the start and end of each file; make arrays for these called SF%(E%) and EF%(E%). If SF%(2) = 6 and EF%(2) = 12, all meta-data for file 2 will be held in the dictionary array locations 6 to 12. A little thought will show that one of these is redundant if the files are assigned contiguous sequential array space, due to SF%(E%+1) = EF%(E%)+1, supposing that you open your files in the sequence 1,2,3, and so on.

To read the dictionary, write a procedure as shown in Fig 3.

File parameters

I have already mentioned FL$(E%), SF%(E%) and EF%(E%), but other useful file parameters which can be stored in an (E%) array are:

IX$(E%) — index name
NR%(E%) — pointer to the next free record
N%(E%) — number of records in use
FS%(E%) — file size, if this is fixed
DR%(E%) — data record length

Some of these are picked up from the dictionary as shown; others may be stored in the header record, conventionally numbered 1 or 0 according to your DOS. Rather than pick up the data record size from the dictionary by adding up the fields (which is fine until you want another couple of bytes), you can store it in the first line of the dictionary with the name, and so on, and build some spare capacity into your record. When you have opened the file, you can read any file header data into the file parameter arrays for handy reference.

To start your program, you have to write a few application-specific lines. Firstly, DIM your data dictionary arrays large enough to hold all the meta-data you want, then write something like this:

```
1000 DATA "CUSTOMER.DAT",
  "PRODUCT.DAT","INVOICE.DAT"
1010 FOR E%=1 TO 3: READ
  DIC$:GOSUB 500: NEXT
```

— and for this small effort, all your files are opened and fielded.

The whole exercise is much simplified if you store all numbers, dates, and so on, in string or ASCII format: for example, the number 12.345 stored as the string "12.345". This occupies more disk space, but not significantly so (unless you need to store a great quantity of single-precision numbers or large integers), and it has several important advantages:
1) You don't need to convert data when you read it or write it.
2) You don't need the F%( ) parameter — your field lengths are L%( ). Forget everything in line 570.
3) You don't need to do tiresome number conversions specifically to ensure that 10 doesn't come out as 9.99999999999, or something similar.
4) Your data can be directly read by any comms system.
5) Programmers' file dumps can be read much more easily.

When you read (GET) a record from disk, what you really want is the set of strings IN$(SF%(E%)) to IN$(EF%(E%)). Unless your files are ASCII, this needs quite complex conversion; the opposite applies when you write (PUT) a record. You should write a GET or PUT so that you need only specify the file number and the record as E% and R% (Fig 4).

The GET procedure leaves you with lines like this:

```
IF T% = 4 THEN Q$ = MID$(STR$(CVI
  (F$(J%))),2): IN$(J%) =
  SPACE$(L%(J%) — LEN(Q$)) + Q$
```

Contemplation of this method will convince you of the simplicity, not to mention speed, of using the ASCII format. In most versions of Basic, it is impossible to write a decent keyboard input procedure in anything other than string format, so it makes a lot of sense to stick with the same strings unless you are compelled to do some calculation with them. This rarely happens in data processing, so it can't be considered the exception rather than the rule.

Flexibility

When you have written and debugged your procedures (the examples featured here may need modification according to the language or Basic dialect you use), you need never go through the process again. The point about these procedures is that they will deal with *any* data which

ASCII version 'put' procedure

```
700 FOR J% = SF%(E%) TO EF%(E%):
              IF P%(J%) < 4 THEN 720
710           LSET F$(J%) = IN$(J%)
720 NEXT:     PUT #E%,R%
```

'Binary' version

```
700 FOR J% = SF%(E%) TO EF%(E%):
              IF F%(E%) = 0% THEN 720
710           T% = T%(J%):
              IF T% > 5 THEN LSET F$(J%) = IN$(J%)                ELSE
              IF T% = 5 THEN LSET F$(J%) = CHR$(VAL(IN$(J%))) ELSE
              IF T% = 4 THEN LSET F$(J%) = MKI$(VAL(IN$(J%))) ELSE
              and so on, with special consideration for dates
```

Fig 4 Specifying a file number and a record as E% and R%

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are specified in the way which you decide to be standard for your dictionary system: they are to application-specific software what algebra is to arithmetic.

To change your data display, slightly edit your dictionary and make a different version for each application of the same file. For example, a customer file might be used in programs for: customer file maintenance, invoicing, statement preparation, sales analysis, credit control, and so on.

In only one of these will you need all the data available for input, display and filing, complete with full prompts. For example, you may want a customer name and address displayed top-left for invoicing, but none of the other customer data. For statement preparation, display nothing, but transfer fields to the printer output (the printer can be treated as just another file in many respects). You create a series of minor variants on the file maintenance dictionary using PIP or Copy, and your text editor, for example, CUSTMAIN.DIC, can give rise to CUSTINV.DIC, CUSTSTAT.DIC, CUSTSALE.DIC, very quickly. Prompts, defaults and warnings will mostly vanish to nulls.

The dictionaries in any application can be assigned any file number you please, but it is good practice to keep your numbering self-consistent, and to reserve the lower numbers for data files with the higher numbers allotted to dictionaries, and so on. Furthermore, your file openings, fieldings and read-write statements are already done, no matter what your application. You can take the PUT subroutine a stage further by building in something to locate the next free record, so that you only have to pass the file number to the subroutine.

'The dictionaries in any application can be assigned any file number you please, but it is good practice to keep your numbering self-consistent...'

Further ideas

The same simple technique, that of reading in a short text file as screen display, can be readily adapted to screen displays, help texts and menus, and also to specify print formats. It is easy to read in print formatter strings for PRINT USING. A more sophisticated subroutine can read in page headers, titles, numbers of leading and trailing line feeds, leading spaces, paging instructions, and the array numbers of the output strings to be used. Again, you can minimise the programming needed, although you will need to write lines to extract your data for printing in the required sequence. The technique also saves you considerable program space, otherwise you will hold the necessary meta-data twice — once in the assignment statement, and again in its memory space.

END


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EXPERT SYSTEMS

SPECIAL REPORT

Getting a head start

Can your PC become your closest advisor? Richard Marsland looks at how expert systems can offer you some expert opinions.

Artificial Intelligence is a term being used in recent months. Implying the development of a new thinking and learning process, AI focuses on *intelligence*. While current applications have been developed as a result of AI research, these are more correctly termed Expert Systems. This article has been written in an attempt to disabuse readers of any misconceptions they may have gained, and to encourage their interest in this new technology.

In essence, an expert system consists of two things: an 'inference engine', which directs you to a particular piece of knowledge depending on your requirements, and a 'knowledge base', which contains the expert knowledge you are trying to consult.

Perhaps the most useful analogy is that of the database. A database program maintains data files and responds to your requests by retrieving the element you want. Similarly an expert system contains expert knowledge in its files and retrieves a diagnosis or recommended course of action.

This means expert systems embody a form of 'artificial intelligence'. They can give apparently reasoned and informed replies to queries in their particular field of expertise, and as such can to some extent replace the expert whose knowledge they contain.

So, in general business, they can support management decisions by processing the criteria for the decision and giving a recommended action in response.

But this does not mean that expert systems are necessarily objective or always correct. The knowledge they contain and automate is provided by a human expert, and as such is defined and limited by his or her own decision processes. The program embodies certain responses to particular input, but is not in itself intelligent.

What expert systems can do is reproduce the reasoning processes of valuable experts when they are not present. This knowledge can cover any area from medical diagnosis to financial investment decisions.

These are the basic tenets of an expert system. But as the product reviews later in this issue show, each of the companies involved in expert systems development has taken a different approach to the problems of automating expertise — or of 'knowledge engineering' as it is called.

And each of these approaches means the end product is suited to different application uses in varying parts of industry, and to different levels of technical sophistication in users.

Packaging approaches

There are three broad approaches to the packaging of expert systems for the PC market. The first and most widely known is the 'expert system shell', which combines an inference engine with a user interface for inputting expert knowledge. In effect, it is a reasoning program waiting for rules or examples that it can automate.

Second is the customised expert system, usually designed for some vertical application area such as medical diagnosis or capital asset evaluation. This is sold complete with the knowledge base for its inference engine to work on.

The third approach consists of expert systems environments and languages. *Prolog* (see review in this issue) is a good example of this approach, but recent developments in the microcomputer arena have seen the release of new products offering less of a programming than an end-user design approach, and blurring the distinction between themselves and User Shells.

A danger in the 'Expert Systems' area is the software package that embodies some knowledge and decision making criteria, but does not make this basis clear to the user. For example, a system to monitor investment performance may not be adapted to medical diagnosis.

An equal danger is that the knowledge base may simply be wrong, or not suited to the environment in which it is to be used. Many so-called Sales and Marketing aids may work well under the conditions for which they were designed (perhaps West Coast US consumers) but will not stand up in cultures conditioned to a more formal approach (Asian or Old European).

The biggest growth area in Expert Systems seems to be that of Expert Shells. many overseas companies are packaging systems that will allow an intelligent user to create a pilot expert system in a fraction of the time necessary to develop a Prolog application, with the ability to further develop the system when required.

Division of systems

The clearest division is between systems that are 'deductive', in which you enter a series of rules to be followed, and those that are 'inductive', in which a list of examples or precedents is entered, and the system itself then induces its

knowledge base rules from that.

A 'deductive' system might be best suited to applications where there are definite rules which an expert can derive from his or her everyday knowledge. These could come either from a set list of regulations — like tax or insurance rules — or could be identified through consultations between an expert and a 'knowledge engineer', or expert systems programmer.

On the other hand, 'inductive' example-based systems are generally more useful where the knowledge is strictly that of knowing precedents. These packages will also generally require less consultation with the expert whose knowledge is being automated. They are generally easier to use, but also less flexible in the amount of reasoning they can do.

A further difference between these kinds of system is the handling of uncertainties. An example-based expert system shell, which merely accepts a set decision table from which it devises solid rules, may have no provision for handling uncertainties. Rule based shells and programming environments, however, provide the developer with the scope to implement degrees of possibility and uncertainty.

The differences between rule and example-based shells do not stop at the means of inducing or deducing rules and solutions. There is also the classic clash between 'backwards' reasoning, where a system begins with a set goal and reasons backwards to assess the possibility of attaining it; and 'forward' reasoning, such as that used in diagnosing an illness from a list of signs and symptoms.

Aside from expert system shells and operating environments, the other major set of products is vertical market applications embodying a knowledge base and inference engine. These are likely to spread as the currently available shells become adapted and amended for use in particular technologies. An example of a vertical market system is the Mycin medical diagnosis system, used in the determination of infectious diseases, in widespread usage throughout the United States.

Looking to the future

So what is the commercial future of expert systems? As yet, the market is immature, particularly in industry and commercial data processing. The reaction from the commercial computing fraternity has been more 'what do they do', rather than 'what can they do'. DP professionals have tended to see only the hype associated with expert systems, and have awaited the development of successful pilot projects.

One of the biggest factors likely to lead to widespread acceptance of expert systems is the increased ease of use. New systems are using menus and windowing, rather than needing programming. The difference is like that between analysing a company balance sheet by hand, and then using a spreadsheet program.

The increasing availability of sophisticated expert tools on microcomputers is also sure to contribute to the future development of the technology, particularly in large companies. But as in other areas of computing, there is no one solution to the questions raised by expert systems — all we can suggest is that you begin evaluation programs with the tools currently available, and work to the future of this exciting new area of technology.

END

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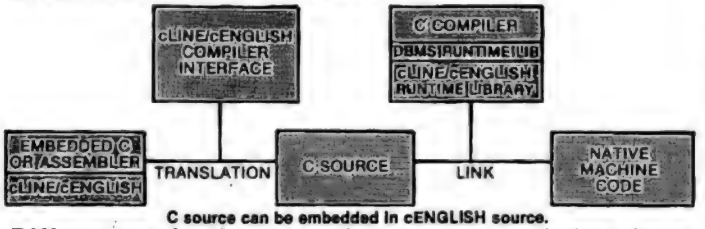
What is cENGLISH? cENGLISH is a comprehensive fourth generation procedural language based on dBASE II syntax. It is portable to a wide range of micros and minis. The language features user-transparent interfaces to a wide range of popular C compilers, operating systems, and data base managers.

How is portability cENGLISH through it's compiler interface translates cENGLISH into documented C source and uses a host C compiler to produce native machine code.



C source can be embedded in cENGLISH source.

Differences in the operating system and data base manager are handled by the runtime libraries.

The result is that cENGLISH source can be compiled without modification on any micro or mini configuration supporting cENGLISH.

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Also available: the dBASE II to cLINE/cENGLISH Converter to ease the conversion task. Up to 95% of dBASE II code is automatically converted to cLINE/cENGLISH. It requires about the same effort as converting to dBASE III and provides many more benefits.

SAMPLE cENGLISH PROGRAM

```
IDENTIFICATIONS
   MODULE:   Mininame
   AUTHOR:   bcs
   DATE:     8/29/84
   REMARKS:  Sample cENGLISH program that adds first
             names to a file
END IDENTIFICATIONS

GLOBALS
   FIXED LENGTH 1 ans
   FIXED LENGTH 15 Fname
END GLOBALS

MAIN PROGRAM

   BEGIN
      CLEAR SCREEN
      SET ECHO OFF

      USE "NAMES"
      VIEW BY "ID_FNAME" ASCENDING

      AT 23, 1 SAY "Add a record? Y or N"
      AT 23, 25 ENTER ans USING "!"

      WHILE ans EQ "Y"
         CLEAR GETS
         AT 6, 1 SAY "Enter first name"
         AT 6, 20 GET Fname
         READ SCREEN

         INSERT
            Fname = Fname
         END INSERT

         AT 12, 10 SAY "Welcome to cENGLISH", & Fname
         WAIT
         AT 14, 10 SAY "HIT ANY KEY TO CONTINUE"
         STORE "                    " TO Fname
         STORE "  " TO ans
         AT 23, 1 SAY "Add another record? Y or N"
         AT 23, 30 ENTER ans USING "!"
         CLEAR ROW 1 THRU 23

      END WHILE

      AT 12, 10 SAY "That's all for now!"
      UNUSE "NAMES"
      SET ECHO ON

END PROGRAM
```

I'd like to know more about cENGLISH. Please send further information.

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Company

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Prolog: a logical choice

Prolog is becoming increasingly popular as a programming language for artificial intelligence software. Chris Naylor shows how it works.

Many artificial intelligence (AI) applications are written in conventional, or more or less conventional, languages — with Basic and C being about the most popular. In fact, there's no real reason why an AI program shouldn't be written in any particular language at all. As long as that language enables you the programmer to get at the machine in some way or another, then any application is possible in that language.

But different languages do have their advantages and disadvantages. These might be simply speed of execution or something equally mundane but, also, they might be the way that a particular language affects how you think about the problem you're trying to solve. For instance, use Cobol and you'll start thinking of problems in a file-orientated way; use Basic and you'll try to solve every problem using a FOR loop, and so on.

Now this is fine as long as you can avoid the mental trap of letting the language dictate what you try to program and if, by dint of effort, you can actually force the language to solve your problem.

But, for some people, this is an uphill task and, as before in the history of computers, people have started to look for and design languages which will enable them to program an implementation of their task with the minimum of effort. That was the thinking that led to all of our current computer languages — and AI is no exception.

For a long time LISP (List Processing Language) has held sway as the most popular AI language but, increasingly, Prolog is taking its place as the number one language helped, no doubt, by the fact that the Japanese chose it as the core language of their Fifth Generation project.

So, if you're interested in AI you could well be interested in Prolog and, even if AI isn't your cup of tea, it may still be worthwhile taking a look at this language simply because it's like nothing you'll ever have seen before.

Prolog stands for Programming in Logic and, essentially, it is based on a system of logic known as the 'first order predicate calculus' — news of which might be enough to put most people off. But, in practice, you don't need to be a trained logician to understand it, you just need to have a fairly devious brain.

For the most part, the various parts of Prolog can have quite esoteric names and it depends on what you read as to how esoteric the language sounds. Where possible, we'll keep it simple.

A Prolog program is made up of two types of sentence — facts and rules. A fact is a simple statement and a rule is a conditional statement. So: the following is a Prolog program:

```
mortal(X):-man(X).
man(socrates).
```

The first line is a conditional statement which says that X is mortal if X is a man (the :- is read as a conditional IF). In logical parlance: for all X it is true that X is mortal if it is also true that X is a man. (Note that all Prolog sentences end with a full stop.)

The second line is a simple fact which says that SOCRATES is a man. Now, this is a program and it will run as will any other program — but here we come across the biggest, and most difficult to understand, aspect of Prolog. For Prolog is a declarative language — it consists of a series of declarations in logical form like the two lines given above, as opposed to the better known procedural languages which we are all used to.

In a procedural language you program the machine in such a way as to instruct the machine directly on what it should do. In a declarative language, such as Prolog, you never give any specific instructions to the machine. All you do is make a series of logical declarations to the machine.

To illustrate this point, consider the given two-line program and suppose it to be on disk. We can call it up into memory by using the 'consult predicate' (a predicate can be thought of as an operator). So, if the program were in the disk file with filename SOCRATES then we could key: CONSULT(SOCRATES).

With this the program would be loaded. But it doesn't mean that CONSULT is the same as a LOAD command — it might act the same in many ways, but it isn't. What happened when we keyed in CONSULT (FILENAME), was that Prolog took CONSULT as its current logical goal and attempted to decide whether or not it was true.

So, if we had CONSULT(X) then Prolog would try to work out whether CONSULT was true for some variable X. As it happens, there is a file on disk called SOCRATES and it can be consulted so CONSULT(SOCRATES). evaluates to true. Having keyed this in, Prolog replies with the word YES on the screen — to mean that it is true that SOCRATES can be consulted. The fact that the program SOCRATES got loaded at all was purely incidental to the whole process — it was a side effect of proving the consult predicate.

This business of side effects is how Prolog manages to actually do real, physical things with the computer. Many of the built-in predicates have side effects (such as reading and writing) but you have to remember that in every case they *are* side effects and that, in every case, Prolog essentially tries to prove them true or not as one of its main aims in life.

Having got SOCRATES into memory we can then 'run' the program — but this isn't like running a normal program. What you do is specify some goal and Prolog will then try to decide, from what it has been told in your declarations, whether or not that goal is true. So if you key MAN(SOCRATES) you have asked Prolog if it is true that there is a man called Socrates. Prolog will simply reply YES.

Now, if you key MORTAL(SOCRATES)., Prolog will attempt to prove the goal MORTAL(X) with X instantiated to SOCRATES. To do this it needs to know if MAN(X) is true with X again instantiated to SOCRATES. This is true because it has the fact MAN(SOCRATES) in the program, so MAN(SOCRATES) is true, and MORTAL(SOCRATES) is true. And, true to form, Prolog replies YES again.

Now if you key MORTAL(X). Prolog will try to find out if it is true that there is an X which is such that MORTAL(X) is true. To do this it needs to know if there is a MAN(X) such that MAN(X) is true and this it can prove by seeing that MAN(SOCRATES) is stated to be a true fact. So Prolog will again reply YES but, as a side effect, will also output on the screen X = socrates just so that you know which X it was that satisfied the goal you had asked about previously.

At any time you can alter the information that Prolog has using the ASSERT and RETRACT predicates, to tell Prolog something or to remove from its knowledge something you don't want. So, by keying: assert(man)chris)). and then going through a similar sequence as for SOCRATES I can find out that I am a man and that I am a mortal. This fact could be withdrawn using RETRACT, and instead of facts, whole rules could be added and deleted in the same way.

So far, you've probably followed everything. But quite often you're going to want to do some arithmetic, rather than just ask about SOCRATES, and it's here that the differences with other languages really strike you most. Consider this short program to find the factorial of a number:

```
factor(1,1):-!.
factor(N,Result):-N1 is N-1,factor
(N1,Result1),Result is Result1*N.
```

Well, before we start, I should just mention that this is a pretty nasty one to work out. Also, I should mention that anything that begins with an upper case letter is a variable, otherwise it is some form of constant (which is why we called Socrates SOCRATES — because he was a constant). So we have this program in

PROLOG PROGRAM 1

```
run:- input (X),nl,output(X).
/* Input section */
input (X):-write('Input a sentence :-'),nl,read_sentence(X).
read_sentence(X):-get0(A),read_rest(List,A),name(X,List).
read_rest([], 10):-!.
read_rest([AIB],A):-get0(Next_A),read_rest(B,Next_A).
/* Output section */
output(X):-write('The sentence you input was :-'),nl,name
(X,List),write_sentence(List).
write_sentence([]).
write_sentence([AIB]):-put(A),write_sentence(B).
```

All this program does is to take in a character string from the keyboard and output it again at the screen. You can do this simply in Prolog using the read and write predicates but I didn't feel like terminating my input string with a full stop and a carriage return (as standard Prolog would require) so I wrote my own input/output (I/O) routine.

Also, I didn't like having to remember what goal to specify when starting, so the first goal is RUN which is defined here as being true if the rest of the goals are satisfied. So, by keying 'run.' the whole thing starts up.

Comments are enclosed in this way: / COMMENT */. So, the program has to input(X) and then output it again. It WRITES a prompt to the screen, followed by NEWLINE (NL), then tries to prove READ_SENTENCE(X) which it does by using the built-in predicate GET0(A) to take one character at a time from the input stream.*

In READ_REST it turns this into a list — denoted as variables within square brackets — and tests each character to see if it's ASCII 10 for line-feed. Once it's found this character READ_REST is proved and NAME(X,LIST) turns the list back into the variable X(NAME is yet another built-in predicate).

The output could be handled by simply using WRITE(X) but, for completeness, X is turned into a list again and output recursively in a similar way to the way it was input, using PUT(A) to output each character in the list onto the current output device.

Items to note are the !M ('cut') which stops any further attempts to prove the same goal (mentioned in the text) and the vertical bar within list expressions. This bar means that the variable to the left is the head of the list and the variable to the right is the tail of the list. The head is one item, the tail can be several items.

memory and we want to know the value of factorial 1, say. That's easy because factorial 1 is 1. The way you ask Prolog about this is by: FACTOR(1,X). That is to say: is there an X such that it is the factorial of 1? There is, so Prolog will reply YES and, as a side effect, it will output the value of X that led this goal to be true, and that is 1.

In trying to prove FACTOR(1,X) Prolog finds that it matches the first rule with X=1 halts and then comes back to you

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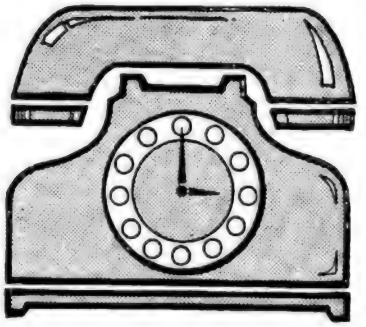

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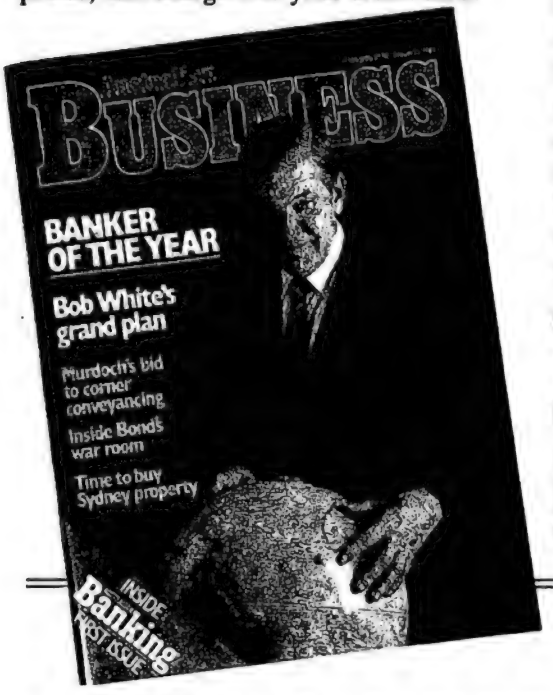

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ABHI

PROLOG PROGRAM 2

```
run:-nl,write('Where are you starting from?'),nl,read(Origin),nl,
        write('Where are you going to?'),nl,read(Destination),nl,
        route(Origin, Destination, Route),
        write('Your best route is :-'),nl,write(Route),nl.
route(Origin,Destination,Route):-path(Origin,Destination,Route,[Origin]).
path(Station,Station,[Station],_).
path(New_origin,Destination,[New,originIRest],Stations_so_far):-
            (line(New_origin,Next);line(Next,New_origin)),
            not member(Next,Stations_so_far),
             path(Next,Destination,Rest,[NextIStations_so_far]).
member(E,[E1]_]).
member(E,[_IT]):-member(E,T).
/*The railway lines: */
line(Kings_cross,martin_place).
line(Central,museum).
line(Town_,central).
line(Museum,st_james).
line(Martin_place,town_hall).
line(St_james,circular_quay).
```

This program gets a bit nearer to practicalities — it gives you the best route to take when planning a train journey from Origin to Destination. The facts concerning the rail network are given as LINE(STATION1, STATION2) declarations at the end of the program.

The main points to note about the program are that on the right hand side of a rule if the items are separated by commas then they are ANDS — so, a comma is the same as AND which means that all the goals have to be satisfied to satisfy the goal on the left hand side.

A semi-colon indicates OR so that the line of code:
(line (New_origin,Next); (Next, New_origin))
means that it doesn't matter which way around the LINE(X,Y) facts are stated — they're bidirectional.

The member goal is a couple of standard lines of Prolog which test to see if E is a member of the list T and, roughly, state that E is a member of T if it is the head of T, or E is a member of T if it is a part of the tail of T.

ROUTE and PATH find a Route from the Origin to the Destination that doesn't involve visiting the same place twice. Keying RUN. starts the whole thing and, after being prompted for details of your Origin and Destination, Prolog will reply YES if the goal can be satisfied and will, as a side effect, output a list of the Route you should follow using WRITE (ROUTE).

Once it's working you can add as many LINE(STATION1,STATION2) facts as you like to build an increasingly large rail network — you can cover the whole of Australia with this program if you should take it into your head to do so.

with X=1 (it doesn't go any further because of the cut symbol, !, on the right hand side of the first :-symbol — the cut means stop here if you've got a match).

If we asked Prolog for FACTOR(2,X) it would fail on the first occurrence of factor (because two doesn't match one) and move to the next line of the program, where N is instantiated to 1 and RESULT is left uninstantiated, and it would try to prove this true. To prove it true, everything on the right hand side of the :- has to be true. N1 IS N-1 is like an assignment statement in its side effects, making N1 equal to N-1 and evaluating to true. It then tries to prove FACTOR (N1,RESULT1) which, as N1 has been instantiated to N-1 (that is two minus one, or one in this example) matches with the first line of the program and turns out to be true, instantiating RESULT1 to 1. It then attempts to prove that RESULT to RESULT1*N which is true and which has the side effect of instantiating RESULT is RESULT1*N (that is, two). After which the whole rule is proved true and FACTOR(N,RESULT) is true with RESULT instantiated to 2 — which is the value that is returned to you. This sounds involved until you get the hang of it.

The snag with this article as a description of Prolog is pretty obvious, though — it doesn't really give you a good, sound, practical idea of what you could do with Prolog that would be useful to you.

In a short space of time you can't really convey a totally new concept in any particularly full way. If you had to describe Basic to someone who had never heard of it before what would you say? Probably you'd describe the FOR loops and, probably, your audience would leave wondering what on earth that would be good for!

There's much more to Basic than FOR loops and there's much more to Prolog than is described here. Maybe, you could just take my word for it and not dismiss Prolog out of hand right at this very moment for, I assure you, there really is something useful about the language.

Maybe the example programs shown here will help to convince you.

END

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Take it from an expert

To establish an expert system you need the right software. Robin Webster, Chris Naylor and Ashok Soni suggest some suitable programs.

Expert systems are not widely available in Australia at the time of writing this article. The packages reviewed were contributed by overseas companies at our request, and are a representative sample of current technology. We suggest you refer to the product listing accompanying this article for further possibilities in the AI market, and watch for the release of new products in Australia.

Expert systems are currently the major bread-and-butter applications of artificial intelligence. Computers can't think —yet — but they can be programmed to *simulate* thought, and if the programming is good enough it's possible you won't notice. Here *APC* looks at five expert systems and sees just how smart they are.

Reveal

Reveal tries to combine expert system and traditional software attributes. It has many typical expert system features, like knowledge-based rules, and also includes programming constructs like IF, ELSE, DO and REPEAT. It has special functions like compound interest, mortgage repayment calculation and depreciation that can be used for developing business decision-support applications and it is equipped with data management and report generation facilities. Finally it can interact with many external data files simultaneously.

Until quite recently, all these functions were available only on IBM 370 mainframes under VM/CMS or on Digital VAX systems under VMS. Now, however, there is a version of *Reveal* for the IBM PC XT, for $A4,000. Naturally, the XT version is somewhat slower than the heavyweight models of the system, and it does require a full 640k RAM as well as an 8087 maths co-processor.

Reveal: a new XT version.

Instead of targeting the usual line-up of expert system applications (such as fault-finding or medical diagnosis) the supplier, InfoTym, has tried a different approach. It appears to be more interested in seeing *Reveal* put to work in the corporate environment since many of the product demonstrations focus on traditional financial applications such as budgeting, forecasting, marketing and project evaluation.

One reason why *Reveal* is better-suited to the financial world than many other expert systems is that it was developed in Fortran. Prolog and Lisp, the preferred AI languages, tend to excel at processing symbolic, not mathematical, information.

It consists of three major components: a table or matrix of data, a program model that describes the relationships within the matrix rows and columns, and an optional, 'policy' program that can contain any relevant knowledge-based rules and be called by the program model. You will also have to set up variables and constants and define so-called 'qualifiers'. All these features, when combined, are called the *Reveal* 'context'.

Tailoring applications

Reveal's design, however, is based on the premise that you should be able to build your own inference procedures and tailor them to individual applications as you see fit. Though not a bad idea, it can make program development into more of a job for the skilled programmer than a tool for the novice user.

Suppose you want to set up a simple table to help you set the price of a product, taking into consideration manufacturing costs and what the opposition is charging for a competing product. First, you have to decide what categories of data you will be dealing with and then create a *Reveal* table to hold that data (the rows are called series, and the columns are called terms, and these can be labelled with the names of your choice).

Data is entered into the cells of the table with the ENTER command a row at a time. And although your table will resemble a spreadsheet, it is not, and you are not allowed to roam about it freely.

Once you've entered raw data items like total cost, price and revenue, then entries are generated by formulae.

But *Reveal* differs from a spreadsheet

package in that, when you develop a model, you have the full facilities of a true programming language. You can create conventional algorithmic routines using procedural statements and standard arithmetic operations.

To produce data like total cost and revenue results, you start up the *Reveal* editor. This is primarily line orientated so each model line is identified by a unique number, with an exclamation mark showing where you can enter comments into the model space. You have a wide range of text-editing commands at your disposal.

If you set up a table, enter some information and then compile a model; you will then find that the correct revenue values have been added.

But you still haven't added any kind of intelligence or knowledge to the pricing program — it is merely working as any other high-level program might. This is where the aptly named concept 'fuzzy logic' comes into play.

Conventional programs tend to be more useful in applications that require manipulation of precise data. But the *Reveal* system is designed to deal with a more human world in which data need not be manipulated so precisely and in which judgment and evaluation can be only approximate. Theoretically, therefore, by employing fuzzy logic, the program has a much greater chance of following your perception of the conditions around you accurately.

Reveal's application of fuzzy reasoning relies on linguistic variables, qualifiers and hedges, and 'noise' words. Unit cost and volume are examples of linguistic variables. Words like 'low', 'high' or 'reasonable' are qualifiers, and 'very', 'quite' and 'about' are hedges that can be used with qualifiers. Noise words are simply such phrases as 'should' 'be' or 'out' that improve the readability of policy statements but do not affect their logical meanings.

These terms come in when you want to change basic information into something that can, say, monitor a product's price and change it according to the opposition's price fluctuations.

If you want to, include a policy statement that says 'Our product price should be low, and our price should be low, and our price should be about twice our unit cost. On the other hand, if the opposition price is not too high, then our price should be near its price,' *Reveal* allows you to enter statements pretty much in plain English like this policy statement.

In all, the package's price and marketing approach mean that it will be treated more as a conventional mini/mainframe product than as a mass-market XT product. *Reveal* looks and feels like a corporate PC product, especially as you can link XTs up to a mainframe that supports *Reveal* and interacts with it on a shared basis. And then there's the important capability that links *Reveal* to conventional database files already stored in the corporate mainframe.

InfoTym has placed its product in a rather unique and enviable position in the expert systems marketplace. It straddles the fence between traditional decision support systems and advanced AI endeavours. Its user interface could do with a little more work, but it's not a material disadvantage since it's not designed to be sold to inexperienced users.

If you want to become familiar with expert systems work and yet not cast off from the mainstream of business computing, *Reveal* may be just the system that you are looking for.

Tess

Tess (The Expert System Shell) is very much in the mould of the textbook expert system. It can handle uncertainty, it can explain its line of reasoning, and it can explain why it's asking you a particular question. Effectively it is a handy package which can be used when you are setting up an expert system.

Tess relies on 'Bayesian inferencing techniques' (the brainchild of an 18th Century English vicar) in order to offer its expert advice. The theory behind Bayesian inferencing is that everything must have some probability of being true. It may be a low probability (as high as 1, for an event which is always certain to occur) — but there will always be some probability involved, whatever the event. This is called the 'prior probability'.

What this means for the user is that you have to name a conclusion and the items of evidence which relate to it. Then you give the prior probability for that conclusion being reached and the conditional probabilities associated with each relevant item of evidence.

Tess works by checking each final conclusion in turn and looking to see which items of evidence have a bearing on that conclusion. For each item it either asks you a question or digs into its knowledge base to see if the evidence is the conclusion resulting from other items. This process is known as backward chaining.

Evidence coming into the system is used to amend the 'prior probability' of each conclusion. If it exceeds a given threshold value *Tess* advises you that this conclusion is likely, while if it finds that none of the conclusions can exceed the threshold, it asks you if you'd like to alter the threshold level.

Tess: ideal for expert systems.

Essentially it works like some of the best-known textbook expert systems around. You can set it up either by using a fill-in-the-blanks type of screen template (easy for beginners) or by using Tessul, *Tess's* user language, which might suit the more experienced user. The screen display is windowed, and the system gives you, to a certain extent at least, some control over its format.

Tess has the ability to pull in data from external files, including spreadsheets. This is particularly useful, because if you have the data already on a spreadsheet it is inconvenient to have to stop your expert system, run the spreadsheet to find a value, and then go back to tell your expert system what that value was.

I found *Tess* easy to use, although I would have liked more on-screen help with the function key commands, and it took very little time to put up a simple expert system for medical diagnosis (the classic application) using the examples in the manual and on the demo disk to produce rules of the form:

```
COMMON COLD IS LIKELY
IF YOU ARE SNEEZING,
AND YOU HAVE BAD COUGH.
****END OF RULE****.
```

I was a little doubtful about the exact way in which *Tess* used AND — it looked, to me, not like a logical AND, so much as a logical OR. In the example given here *Tess* would diagnose a cold if you were sneezing *or* you had a bad cough, rather than insisting on both conditions being true before you're reaching for the tissues.

But nit-picking aside if you're looking for this type of Bayesian expert system, *Tess* seems a good, solid buy, and its ease of use makes it a reasonable introduction to expert systems shells.

My only reservation is that, while I know how Bayesian statistics work, some people find probabilities of any kind a little hard to come to terms with.

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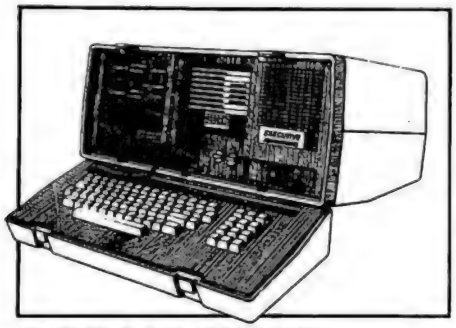

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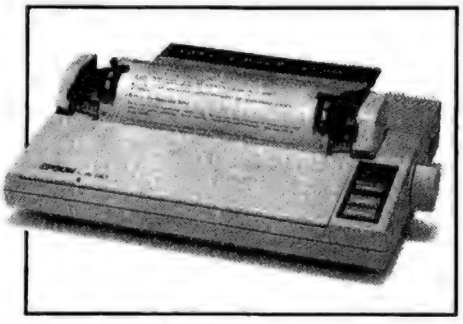

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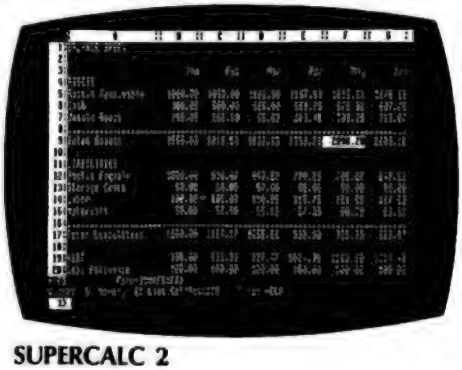

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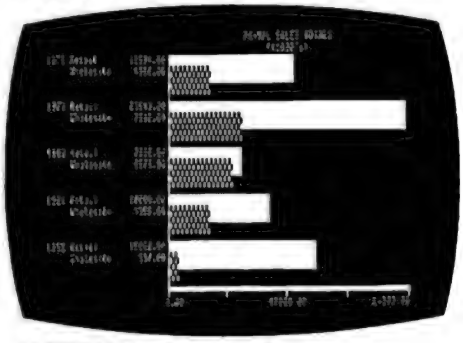

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and as *Tess* is designed to be used by the inexperienced, they may be confused initially.

Nevertheless it's worth persisting with this method as Bayesian expert systems have a well-understood theoretical base to work on.

You may have to put a little more effort into working out how to develop an expert system using this kind of shell than with some others — but, having worked it out, your efforts aren't likely to have been wasted.

Savoir

In many respects *Savoir* is similar to *Tess*. It handles uncertainty using Bayesian inferencing and uses a backward chaining strategy in order to establish its conclusions, or 'goals' in *Savoir* terminology.

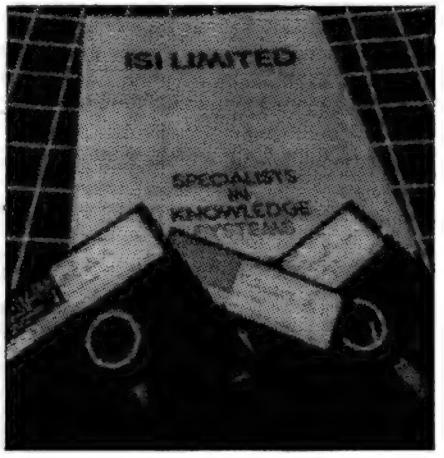
But there are strong differences between the two systems, the overriding one being that *Tess* is easy to use and *Savoir* isn't. You might think this is a damning criticism of *Savoir* but, depending on what you want the system to do, its complexity might well be a point in its favour.

If a program is easy to use assumptions must have been made about what it is to be used for — and this inevitably restricts what you can do with it. All programs place some restrictions on your activities but *Savoir*, for an expert systems shell, places very few. This is largely because it isn't an interactive shell like *Tess*, in which you are guided through a fill-in-the-blanks kind of operation, it is a full-blown language for writing expert systems.

This makes it harder to learn, but you can do more with it. For example, *Savoir* has built-in language facilities for calling external devices — remote sensors, and so on. This means you are not restricted to writing expert systems which simply interrogate any particular user for the answers — the expert system could equally well interrogate a series of external instruments, monitoring them like a human (expert) watchdog.

There are also language commands to implement something very close to fuzzy logic (in the true sense of the term, rather than the somewhat fuzzier sense in which it is sometimes used) as well as a range of logical and mathematical language operations. And output from the program (including output to the screen) is completely under the programmers control — which means that a genuinely tailor-made product can be produced rather than one which is simply shoe-horned into an existing screen design.

The price you pay for all of this is extra



Savoir: has professional appeal.

work in learning how to use the product, and extra work in making it go. For example, you can't just knock up a knowledge base and see what it does in a few seconds. You have to learn the language; write a program in that language using a text editor (a word processing package would be fine, as long as it produces a clean ASCII file without any embedded control characters); compile this text file using SCOMP (the *Savoir* compiler), and run it through PV (the *Savoir* program which sets up initial prior probabilities and checks for overall consistency). You can then run the expert system using the RT (FILENAME) command.

This is not unreasonable if you think of it in terms of a compiled language. *Savoir* will therefore appeal to the programmer who's after an end product which addresses a real application, rather than the casual user.

Savoir doesn't use conditional probabilities in the same way as *Tess* does. It uses what the makers call Logical Necessities and Logical Sufficiencies (LN and LS) which, to statisticians, might be more familiar as 'likelihood ratios'. These are just like those used by the classic expert system *Prospector* and the end result would often be exactly the same as that given by the conditional probabilities that *Tess* uses.

But given the choice I'd stick to conditional probabilities: they produce a greater run-time overhead at execution but seem to me to be much safer at their end points (probabilities of 0 and 1). Likelihood ratios seem to have a nasty habit of producing the occasional value in which 'infinity' occurs — and that is often outside a machine's range. But *Savoir* does seem to have sufficient flexibility in its language structure to prevent this from becoming a real problem.

A typical section of source code might look like this:

```
PROBABILITY program_fault 'There is a
fault in the program
data_ok LS 100 LN 0.01
new_program LS 100 LN 0.002
PRIOR 0.7
```

Savoir itself is written in Pascal and contains the ability to include external Pascal code. It also possesses a modular structure which should enable you to build up quite impressive applications. In some ways it reminds me very much of *ES/P Advisor* — that, too, is an expert system shell which works from its own compiled language. Maybe the reason they both felt so similar is nothing to do with their actual function, but more to do with the fact that they both appeared to be so well made.

Definitely a product that will be of strong appeal to the more professional user.

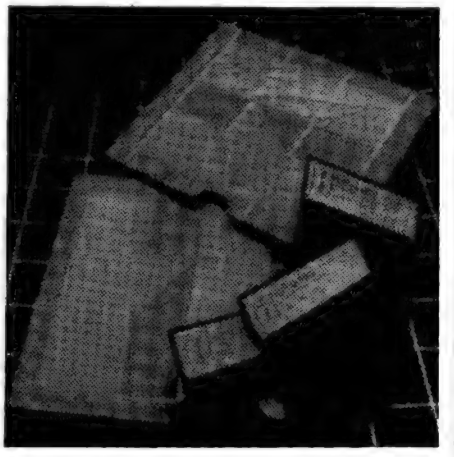
ExpertEase

ExpertEase, one of the better known expert system shells, has been around since 1984. Developed by AI specialist, Donald Michie, the product has enjoyed relatively high sales.

Expert system shells are often defined as products with 'brains but no knowledge'. Once an expert's knowledge has been fed into the system, it will happily use this knowledge base to provide considered advice to non-experts. Although *ExpertEase* fits this definition admirably it is important to be clear about what the product's strengths and weaknesses are.

Two areas of strength exist. Firstly, although rules governing an expert's decision-making process are used to advise the non-expert, those rules do not actually have to be fed into the package.

Instead, when an expert system is being defined, knowledge is imparted in



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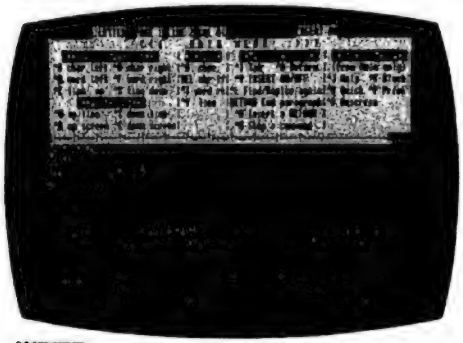

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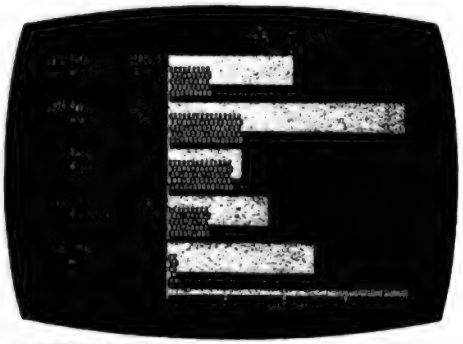

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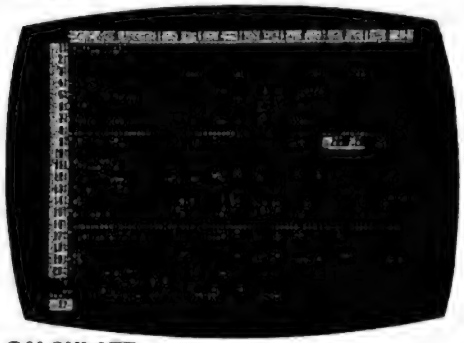

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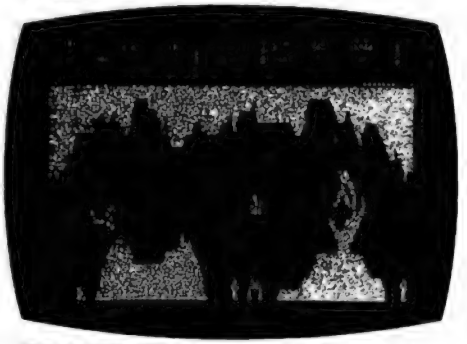

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the form of example data. *ExpertEase* uses this data to generate decision-making rules, which means the completeness of the example data has a direct impact on the accuracy of the rules.

An expert at your site or in your company will be the person who enters the example data. If that is you, first you must split the problem into constituent attributes with, optionally, a list of possible values for each attribute defined. This list of values is displayed in a menu for selection when you enter the data.

To explain a bit more, consider a relatively simple example. Assume that your application concerns approving bank loans. In this case, the attributes may include credit rating of your customer and both the size and duration of the loan. The conclusion attribute would have one of two values — recommendation for or against the loan.

Once the example data is entered, using the EVALUATE command, a decision tree, based on patterns in the example data, is generated.

Part of the decision tree may be: If bank loan is <$1,000 then offer loan if credit rating is X regardless of the duration of the loan.

The problem with this is that a non-expert user using the stated decision rule has fewer variables to handle. For example, if the size of the loan is <$1,000 then that user is only prompted to enter the credit rating and not the duration of the loan. This simplification is an example of an optimised decision rule. (You should note that rules may be changed with new example data.)

But *ExpertEase* demands that the given data is consistent. Thus any contradictions between new and existing data are drawn to your attention. If you fail to 'correct' the data, then the program puts the conflicting example into 'reserve' where, effectively, it is ignored.

ExpertEase's second area of strength is that it gives you a spreadsheet-like interface for entering the definition of a problem. Each set of example data is entered along a row, with each column holding attribute information. The length of the attribute name is limited by the column width, which virtually ensures the use of acronyms. It is possible to display the attribute name in 'decoded' form.

And it is the decoded text which is used to query any apparent discrepancy. For example, consider the attribute name 'duration' and the decoded text 'duration of the bank loan'. When the 'duration' attribute information is requested, you are automatically prompted with the query 'What is the duration of the bank loan?' This makes the expert system pleasant to use, especially to the non-expert.

Suitable applications for *ExpertEase* are those where certainty, not probability, is used to generate expert advice. In other words, *ExpertEase* is not suitable for weather forecasting but proves suitable for, say, the extraction of fault diagnosis rules from quality assurance data.

ExpertEase's massive strengths do outweigh its limitations which, although not critical, are still worth a mention. Firstly, the size of a 'problem model' is limited to 255 examples with 31 attributes and 31 decisions. This limitation can be overcome, however, by linking modules together. This means that once a problem has been divided into logical sections, then conclusions in one section lead to others.

One irritating aspect of the product, especially relevant if it sells in large numbers, is its reliance on the UCSD-p operating system, even though MS-DOS dominates the PC market-place. This means that, although the p-system does not have to be bought to run *ExpertEase* (as it comes supplied with the product), it is incompatible with MS-DOS system facilities and programs which cannot be simultaneously operated.

In conclusion, *ExpertEase* is a relatively low-cost and simple to use expert system shell for deterministic situations. With its ease of use and ability to generate decision-making rules, *ExpertEase* is likely to become a mass market product.

Trigger

Trigger is part of a series of training and application aids for the business community made by Thoughtware. It is a management tool for monitoring and reporting exceptional events.

Its aim is to help managers implement the principles of 'management by exception' — which highlights exceptional deviations from planned targets and guides managers to take a particular action to respond to such problems.

To maximise *Trigger's* usefulness you need to make a close analysis of all your organisational units and associated management controls. (Here management control means something which defines exceptional events — for example a drop in sales below a certain level.) Up to 50 organisational units and 200 management controls may be defined, as well as the individuals who have responsibilities for remedying exceptions. *Trigger* simply gives out a memo to this individual when an exceptional event is detected.

You can define possible causes of problems and appropriate action at initial set-up, and you have to allocate probability values against each cause. Then when an exceptional event occurs, *Trigger* lists the three most probable causes for it and two possible actions for each cause and addresses it to the responsible individual. Up to 700 causes and 700 actions can be stored within the software.

Additionally, once *Trigger* has been set up, you need to enter data about your business regularly. This data is the lifeblood of the system since the greater the historical data, the more refined the probability for each cause stored by *Trigger's* system.

The package is menu-driven with a good interface, and a nice feature is that its reporting facilities allow comparisons between planned data against actual data to be made graphically.

Trigger comes in three parts. The first of these is two diskettes of computer-based training in the principles of management by exception. This is well implemented and uses a mixture of tests, graphics and straightforward display of pages of text.

The second part is a single diskette-based tutorial on the actual use of the system. This, too, is comprehensive and effective — and since *Trigger* screens are also adequately explanatory, there is little need to have *Trigger's* use documented in the manual. For this simple reason, the package's two manuals have very little to say on the *Trigger's* command selections.

To sum up, *Trigger* is closer to a management information package than an expert system, since it is set up by a manager and provides a reporting service to that manager, rather than advice to non-experts. Nevertheless, expert managers will have their expertise enhanced by the package and will have their management exception concepts refined. END

Trigger: enhances expertise.

EXPERT SYSTEMS

SPECIAL REPORT

AI source book

The following is a listing of companies in the United States and United Kingdom offering goods and services in the area of Artificial Intelligence and Expert Systems.

While we can not possibly know of ALL the companies in this area, we believe this listing should provide a more than adequate starting point for persons interested in this technology.

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Golden Hill Computers 163 Harvard Street Cambridge, MA 02139 U.S.A. Tel. 617-492-2071	Golden Common Lisp
Logicware Inc 5000 Birch Street West Tower, Suite 3000 Newport Beach, CA 92660 U.S.A. Tel. 714-476-3634	MProlog
Programming Logic Systems 31 Crescent Drive Milford, Connecticut, 06460 U.S.A. Tel. 203-877-7988	General AI tools
The Programmers Shop 128-1 Rockland Street Hanover, MA 02339 U.S.A. Tel. 617-826-7531	Wide range of programming tools
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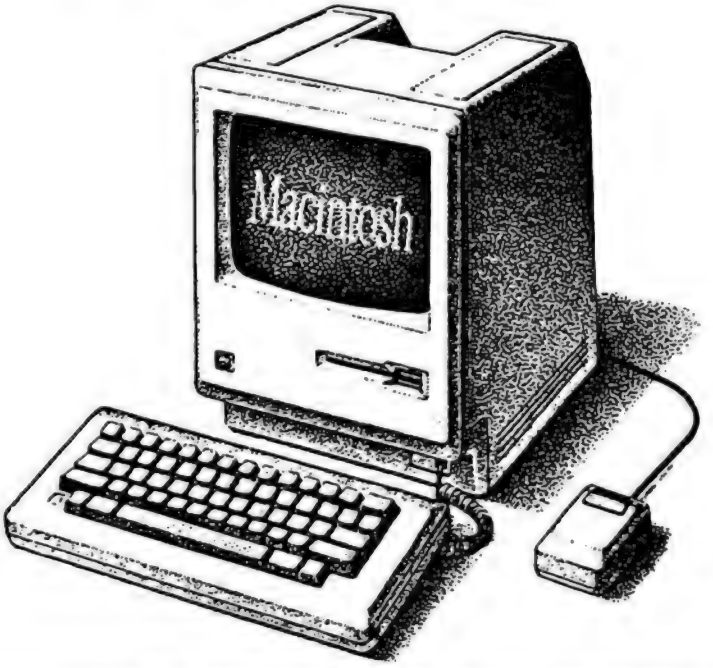

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PC problem solver

To most people, the terms 'Expert Systems' and 'Basic' might seem mutually exclusive — how can a language commonly frowned upon by the professional computing fraternity be useful at the forefront of systems research? We asked Ron Dunn to provide and example . . .

When planning this series of articles on Expert Systems, it seemed a good idea to include a practical example. The problem was that the languages most commonly used in this area (Lisp and Prolog) are not widely owned by our readers.

We then realised that the point of Expert Systems was technique, not implementation. It is perfectly valid to use any tool to implement a system, as long as that tool is understandable by its intended audience.

This article discusses the basic concepts of an Expert System designed to provide elementary fault diagnosis in personal computers, then leads to the development of a Basic program showing how Expert Systems learn and diagnose.

The Basis For Expert Systems

An Expert System requires two basic parts, commonly referred to as the Knowledge Base and the Inference Engine. The knowledge base consists of stated facts, and the relationship between facts. The inference engine provides the means by which these facts and relationships are used to provide a solution to a problem.

To explain these components a little more clearly, consider our simple application. Obviously, to diagnose PC problems we will require information about both signs and symptoms, and the likely cause of those. It will not be much good to accumulate Perth rainfall figures on a monthly basis. These signs, symptoms and causes will form our knowledge base.

The inference engine will be the part of our Basic program that interprets the knowledge base in response to requests for information, and conducts the problem solving dialogue. We will be using

```
1000 '*****************************************************************
***
1010 '    Expert System Example
1020 '    This program has been written to demonstrate some basic
1030 '    principles of Expert Systems.  It demonstrates the construction
1040 '    of a knowledge base, and the operation of a rule based inference
1050 '    engine.
1060 '*****************************************************************
2000 '
2010 '-----Dimension and initialize knowledge base
2020 DIM T$(100),Y(100),N(100)
2030 I = 1: ELEMENTS = 100
2040 FOR I = 1 TO ELEMENTS
2050     T$(I) = ""                              ' Knowledge stack text
2060     Y(I) = 0                                ' YES answer pointer
2070     N(I) = 0                                ' NO answer pointer
2080     NEXT I
2090 '
2100 '-----Create initial knowledge entries to provide simple start point.
2110 T$(1) = "Is the power cord plugged in"
2120 N(1) = 2
2130 T$(2) = "Plug in the power cord."
2140 '
2150 '-----Display initial prompt.
2160 S = 1                                       ' Knowledge stack counter
2170 M = 2                                       ' Current stack height
2180 CLS
2190 PRINT "Please answer the following questions in an attempt to solve"
2200 PRINT "the problem with your Personal Computer"
2210 PRINT
2220 PRINT "Please press any key to continue."
2230 K$=INKEY$: IF K$="" GOTO 2230
3000 '
3010 '*****************************************************************
3020 '    This segment controls the display of the current stack text element,
3030 '    and the processing of the user response if there are possible
3040 '    alternatives at this level.
3050 '*****************************************************************
3060 '
3070 '-----Display current stack text, and process user response.
3080 CLS
3090 IF (S=1) THEN PRINT "New question sequence.....": PRINT
3100 PRINT T$(S)
3110 IF Y(S)=0 AND N(S)=0 THEN GOTO 4000         ' Check for end statement.
3120 PRINT "Press Y if YES, or N if NO"
3130 K$=INKEY$
3140 IF (K$="y") OR (K$="Y") THEN GOTO 5000      ' Process YES response.
3150 IF (K$="n") OR (K$="N") THEN GOTO 6000      ' Process NO  response.
3160 GOTO 3130
4000 '
4010 '*****************************************************************
4020 '    Process probable solution to problem.  If suggested solution is not
4030 '    correct, create new solution and decision chain link.
4040 '*****************************************************************
4050 '
4060 '-----Propose solution to problem.
4070 PRINT "Press Y if solution correct, or press N if not "
4080 K$=INKEY$
4090 IF (K$="y") OR (K$="Y") THEN S=1: GOTO 3000
4100 IF (K$<>"n") AND (K$<>"N") THEN GOTO 4080
4110 '
4120 '-----If problem was not solved, get correct solution.
4130 PRINT
4140 PRINT "Please enter the correct solution:"
4150 M = M + 1: IF (M>ELEMENTS) GOTO 7000
4160 INPUT T$(M)
4170 YPOINT = M                                  ' Pointer to YES chain
4180 M = M + 1: IF (M>ELEMENTS) GOTO 7000
4190 NPOINT = M                                  ' Pointer to NO  chain
4200 T$(M) = T$(S)
```

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```
4210 PRINT
4220 PRINT "Enter a question with answer YES if the problem is:"
4230 PRINT "    ";T$(YPOINT)
4240 PRINT "and NO if the problem is:"
4250 PRINT "    ";T$(NPOINT)
4260 INPUT T$(S)
4270 Y(S) = YPOINT
4280 N(S) = NPOINT
4290 S = 1
4300 GOTO 3000
5000 '
5010 '*************************************************************************
5020 '    This segment processes a YES answer to a question.  If a pointer to
5030 '    a YES chain link is present it will be displayed, otherwise the
5040 '    solution to the problem will be requested.
5050 '*************************************************************************
5060 '
5070 IF (Y(S)>0) THEN S = Y(S): GOTO 3000
5080 PRINT
5090 PRINT "I have no further suggestions to make.  To add to my knowledge"
5100 PRINT "base, please enter the solution to the problem."
5110 M = M + 1: IF (M>ELEMENTS) GOTO 7000
5120 INPUT T$(M)
5130 Y(S) = M
5140 S = 1
5150 GOTO 3000
6000 '
6010 '*************************************************************************
6020 '    This segment processes a NO answer to a question.  If a pointer to
6030 '    a NO chain link is present it will be displayed, otherwise the
6040 '    solution to the problem will be requested.
6050 '*************************************************************************
6060 '
6070 IF (N(S)>0) THEN S = N(S): GOTO 3000
6080 PRINT
6090 PRINT "I have no further suggestions to make.  To add to my knowledge"
6100 PRINT "base, please enter the solution to the problem."
6110 M = M + 1: IF (M>ELEMENTS) GOTO 7000
6120 INPUT T$(M)
6130 N(S) = M
6140 S = 1
6150 GOTO 3000
7000 '
7010 '*************************************************************************
7020 '    This segment processes an error detected in knowledge base stack
7030 '    size.
7040 '*************************************************************************
7050 '
7060 CLS
7070 PRINT "Knowledge base size exceeded - program cancelled."
7080 GOTO 10000
10000 '
10010 '************************************************************************
10020 '    This segment controls the exit from the program.
10030 '************************************************************************
10040 '
10050 CLS
10060 END
```

rule based inference. That is, by defining the rules (or causes) governing a problem, we may be able to determine the solution to that problem.

The System Structure

Our application requirements are really very simple. We need to build a database of problems experienced with a computer, then decide what action is likely to correct those problems.

The program to fulfill these requirements is shown in the listing accompanying this article. The program was written in BasicA on an IBM Personal Computer, but should run without difficulty on most implementations of Microsoft Basic.

The design of the system is such that it will continually learn — if you enter details of problems as they are encountered, those details will be used for future diagnosis. Unfortunately, however, as we are only attempting to demonstrate some basic principles of Expert Systems the programming of this application has been kept simple. All rules are stored in arrays, and if you switch off the computer, you will lose all data.

The program operates in the following manner:

1. On entry, the knowledge base structure is initialized to ensure correct data values. (lines 2000-2080)
2. A basic start point is seeded into the knowledge base, with a suggested solution to a problem. This is only done to ease the entry to the application. (lines 2090-2130)
3. The program then reaches a loop point at which text from the knowledge base is displayed to the user. Action is taken depending on whether the text item is identified as a question, or as a possible solution. (lines 3000-3160)
4. If the current text item is a possible solution to the problem, the user is prompted for correctness. Should the answer be incorrect a new solution must be entered, along with a question to be used in identifying that solution. (lines 4000-4300)
5. Where the text item is a question, action is taken based on the YES/NO response given. If another text item is pointed to, the program will return to point (3), and continue processing. If no other action may be determined, the program will admit defeat and request that you add the problem solution to the knowledge base. (lines 5000-6150)

As this is an example of technique only, there is no attempt to represent good programming. It was hard enough remembering how to program in Basic, without having to invent hundreds of lines of validation and control code.

'And I bought this one to explain the manual of the first one.'

Using The System

Presented below is a typical dialogue with the system. The computer generated text is in normal type, and your answers are in BOLD. Notice how each problem solved generates more knowledge within the system:

New question sequence . . .

Is the power cord plugged in
Press Y if YES, or N if NO
<--Press Y

I have no further suggestions to make. To add to my knowledge base, please enter the solution to the problem.
? The disk drive is not working

(clear screen)

New question sequence . . .

Is the power cord plugged in
Press Y if YES, or N if NO
<--Press Y

The disk drive is not working
Press Y if solution is correct, or press N if not.
<--Press N

Please enter the correct solution:
? The keyboard is not plugged in

Enter a question with the answer YES if the problem is:
The keyboard is not plugged in
or NO if the problem is:
The disk drive is not working
? Is an error code beginning with 3 shown on the screen

(clear screen)

New question sequence . . .

Is the power cord plugged in
Press Y if YES, or N if NO
<--Press Y

Is an error code beginning with 3 shown on the screen
Press Y if YES, or N if NO
<--Press Y

The keyboard is not plugged in
Press Y if the solution is correct, or press N if not.
<--Press Y

Notice how we have taught the computer a simple fault diagnosis by presenting a set of problem signs and symptoms, each leading to a particular solution. Unfortunately, however, the system will only work with the information it is given. If you type in an invalid solution, or a misleading question, the knowledge base will not be able to correctly diagnose a problem.

Further Experiments

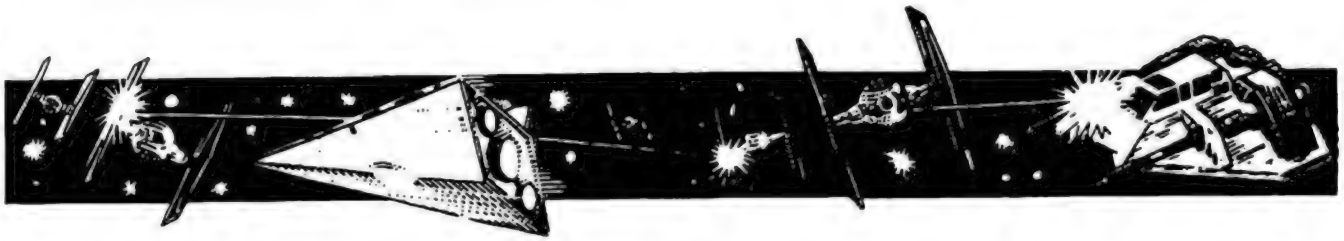
This article has demonstrated a simple Expert System. If your interest in this field has been increased, perhaps a good starting point for further experimentation would be to modify this program to form the basis for your own system.

For example, a good point to start would be the permanent retention of the knowledge base on a mass storage device. This would allow you to continually build knowledge in the area you choose, without having to perform all desired experimentation in one sitting.

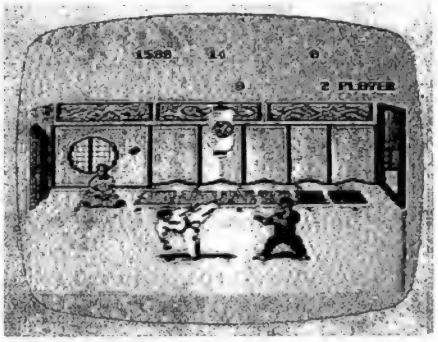
Another desirable enhancement would be the ability to edit the knowledge base once entered. This would provide the ability to change the decision making rules if, for example, you entered a misleading question into the system.

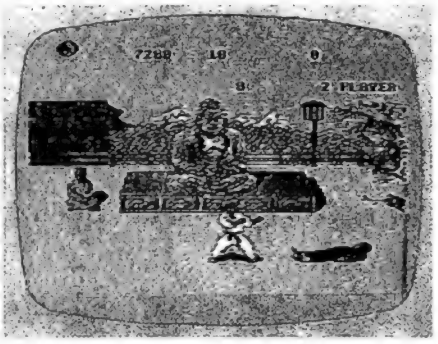
The point we would like to stress is that this is a new area of microcomputing technology, giving EVERY computer user the chance to experiment. We trust you gain a great deal of pleasure from your future efforts.

END



Bruce Lee's got nothing on Stephen Applebaum — his karate's beyond criticism. So's his storming of Beach-Head II and his World War II obsession. Join him in this month's games feast for the Commodore 64.





Explosive karate

GAME: Way Of The Exploding Fist
MACHINE: Commodore 64
SUPPLIER: Melbourne House
PRICE: $24.95

Karate may now be a lost cause for the cinema box office, but it should be a sure-fire winner when portrayed on a computer as realistically as in Melbourne House's superb simulation, Way Of The Exploding Fist.

The game's scenario of two men locked in hand-to-hand combat is simple, but playing it requires a good deal of skill and concentration. One and two player options are available, each providing the user with a very different challenge.

When playing against the computer, the idea is to try and defeat your opponent as quickly as possible within 30 seconds. For every two fights won, you progress by one dan, until you finally reach tenth dan and the accolade of Shaoulin monk. In two-player mode, the full 30 seconds must be fought out for each round. The winner is the fighter who has amassed the most points after four rounds.

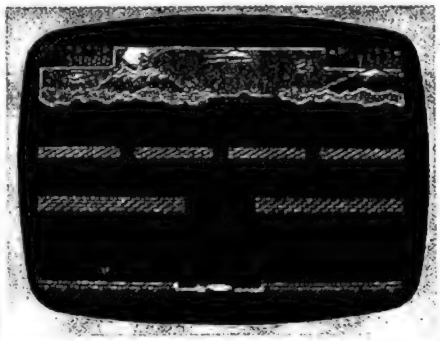
Each timed bout is presided over by a Buddha-like Shaoulin monk who sits in the background of each screen looking inscrutible, and indicates his verdict at the end of a round by holding up a red or white scarf, depending on which of the fighters he considers to have won. An indication of how well you are doing during a fight is given in the form of Yin and Yang symbols. A Yin on its own is a half-point, whereas both together are awarded for a perfectly executed move.

Kung-Fu games are not new on the home micro scene, but their graphics have not been of the high standard of those in Way Of The Exploding Fist. Each of the two fighters is lucidly portrayed using, according to Melbourne House, over 700 sprites. In practice, this means that the movement of the two figures is very realistic, and they are able to go through a good number of different, and in some cases quite complex, movements. There are as many as 18 separate manoeuvres that can be performed, all of which are controlled from the one joystick.

Even with this number of movements, which include kicks, blocks, punches, jabs and somersaults, Way Of The Exploding Fist is surprisingly easy to get to grips with. All you do is twiddle about the joystick, press the fire button every now and again, and you soon find that you're able to floor your computer-controlled opponent with no trouble at all.

The brilliantly animated figures are complimented by some wonderful backdrops, which the programmer has obviously taken as greater pains to perfect as the two figures. There are four screens altogether, the first of which is a chinese garden followed by a beach, a gym and a courtyard.

The Way Of The Exploding Fist is virtually beyond criticism — technically brilliant and visually absorbing.



Suicide attack

GAME: Beach-Head II
MACHINE: Commodore 64
SUPPLIER: Imagineering
PRICE: $34.95 disk

It can't be easy programming a game in the knowledge that its success will depend on how well it sizes up to its predecessor. It must be even harder when

SCREENTEST

Dataflex

Data Access's Dataflex, a powerful database management system, is excellent for system developers but rather difficult for inexperienced users. Kathy Lang examines the package for signs of reconciliation.

Most software suppliers, faced with the task of implementing their packages on a wide range of systems, simply avoid the problem altogether by providing single-user versions only, or put their packages onto just one or two hardware systems.

In contrst to this approach, the supplier of the database management system Dataflex, an American company called Data Access, has long made a point of providing its product on as wide a range of micros as possible, including a wide variety of systems which can be shared among several users. As a result it has achieved widespread popularity among system developers, and is increasingly being bought by computing services in large companies for use by a variety of users in client departments. It was a request from one such user, directed to me by *APC*, which finally decided me to look in detail at a package which has long been a candidate for this series, but which I feared might be just too complex to interest less experienced users. Dataflex's power and flexibility are undoubted, but how easy would it be for those without previous computing experience to use it for simple applications? Here I'll concentrate on this aspect of the package, while adding just a flavour of the power Dataflex can provide for experienced users and system developers.

Dataflex stores its information in fixed length records; each record in a file has the same structure. Files may be related to one another through key fields, with the relationships being specified when the file is set up. The Dataflex philosophy is based upon what it calls 'configurations', which are basically sets of commands prepared for use on par-

Maximum file size	2 gigabytes
Max record size (ch)	Machine limited (min 16000)
Max no fields	255
Max field size	255
Max digits	18
Max prime key length	Not stated
Special disk format?	N
File size fixed?	Y
Link to ASCII files?	Yes, and can vary formats.
Data types	Numeric, character and date
Fixed rec structure?	Y
Fixed record length stored?	Y
Amend rec structure?	Only by copying data file
Link data files?	Y
No data files open	20 (min)
No sort fields	9+
No keys	9
Max key length (chars, fields)	Not stated, 6
Subsidiary indexes kept up-to-date	Y
Date validation	Good
Screen formatting	Paint-a-screen/ must specify columns and rows by number
Unique keys	AM
Report formatting	Paint-a-screen/default format supplied/must specify columns and rows by number
Store calculated data	On input (or updating in batch)/while editing interactively/batch process to change specified fields or records
Totals & statistics	Y
Store select criteria	Permitted but not mandatory
Combining criteria	AND (must pass all tests)/OR (may pass any one test)/NOT (must not pass test)
>1 criterion/field?	Y
Wild code selection?	Field may contain specified characters
Browsing methods	Yes, by any key for viewing or editing
Interaction methods	Menus/commands/full tailoring
Reference Manual+	***
Tutorial Guide+	Not provided
Reference Card+	****
Online Help+	**

Fig 1 Features and constraints (for 16-bit systems)

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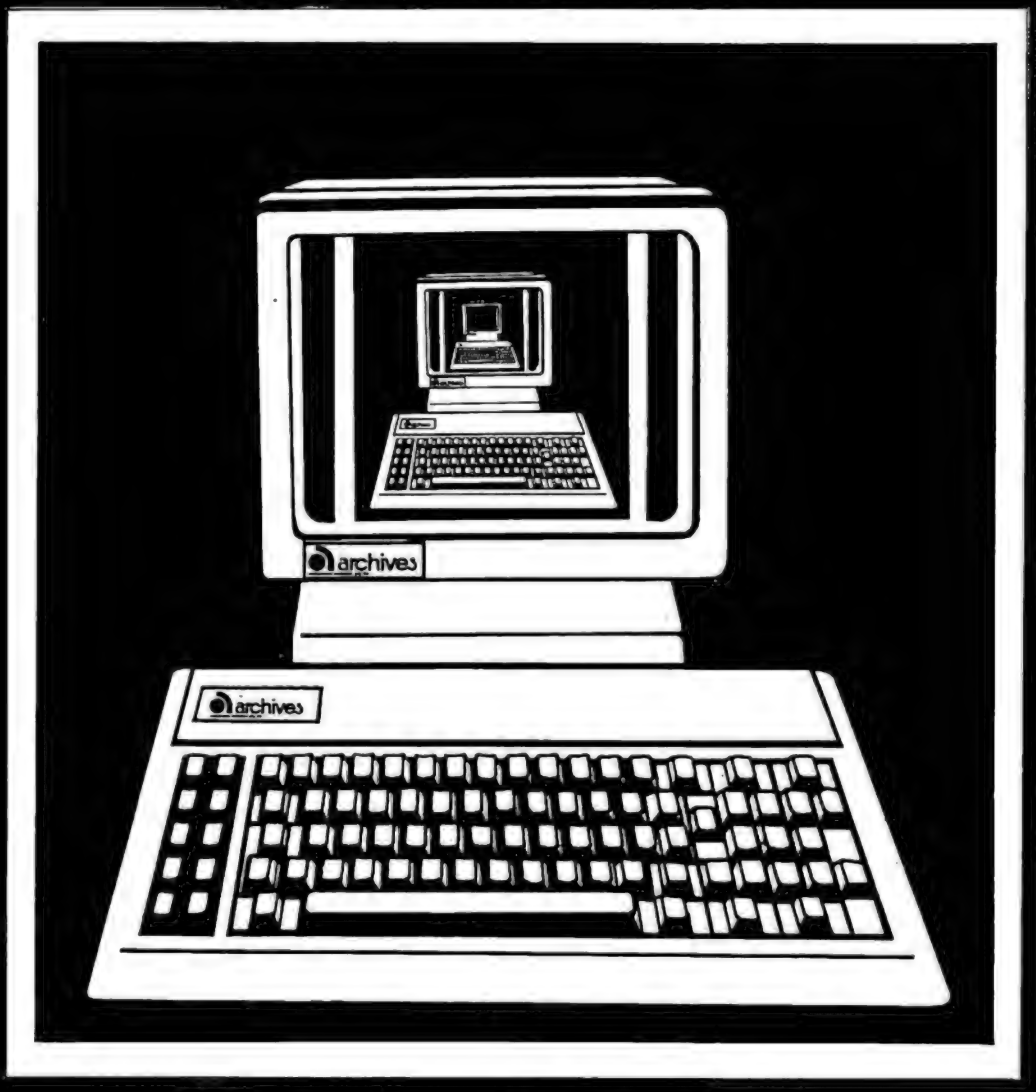

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ticular sets of files. To be used, configurations must be compiled, in contrast to most command-driven packages which interpret commands once for each time that a sequence of commands is executed. From a user's point of view, this means that the first time a task is carried out, two operations are required (rather than the one needed in most such packages). This is because, after you have set up a sequence of commands, you must first compile the source code and then execute it. When this has been done, you may re-execute the same sequence without recompiling.

In this respect Dataflex has much in common with program generators, which must go through a translation phase before being executed. Unlike most program generators, the output of this translation phase is always a compiled program, which may be faster to execute than a comparable set of interpreted commands. (From the Benchmarks, it would appear that for operations within Dataflex, the package is indeed relatively fast.) So you have a trade-off between taking a little longer to set up the commands needed to run a task, and the time taken to carry it out.

Dataflex provides two major aids to making this process reasonably easy for novices, and reducing to a minimum the dangers of rigidity in the two-stage approach. Firstly, a set of programs and utilities is provided to enable you to carry out the main data management tasks which most people require — setting up files, adding and amending records, displaying and printing simple reports. With this basic set of features, you can use Dataflex as a simple data management system without going near the individual commands of Dataflex itself. These utilities can be accessed from the menus supplied with Dataflex, so that a reasonable degree of power is available just through the use of menus. Better still, most of these programs and utilities actually create Dataflex configurations. The advantages of this are two-fold: you get a ready-made set of examples of configurations to supplement those supplied with the system; and you have a basic set of configurations which you can adapt to add extra features, rather than starting from scratch to learn what is really a high-level programming language.

Secondly, there is one menu option which not only helps novices, but also goes a long way to offset the disadvantages of the two-stage approach. The area of application which suffers most from a totally compile/execute approach is *ad hoc* queries. The flexibility of Dataflex is such that it would be possible to write a complete configuration which offers all the options for querying you could think of, with parameters (such as selections to be performed) entered when the configuration is executed. This would take a long time and a lot of expertise, so Dataflex provides such a facility itself, called Query. I'll say more about its facilities under 'Selection & sorting'; for now, suffice it to say that Query is sufficiently flexible to allow you to meet most requirements for one-off lists and reports. In addition, due to Query being an executable program, it can be given the options needed and executed immediately, rather than setting up the query commands, compiling and then executing them. Another consequence of this approach is that Query can be used even with the Dataflex run-time system, to generate *ad hoc* reports within the framework of a tailored system.

For more experienced users, the two great advantages of Dataflex are its flexibility in providing the equivalent of a high-level language with special facilities for handling databases, and its multi-user features. The latter are provided in such a way that each user of a shared database can be provided with an accurate picture of the data which their actions will update, but the sequence of operations can be arranged so that records are locked for the minimum period of time necessary to protect data integrity. A further boon is that, unlike some of its competitors, Dataflex is not copy protected. For those who sell the results of their labours, the availability of a run-time system will be an additional recommendation.

Constraints

The main limitations are shown in Fig 1. The figures shown are the minimum which may be available on 16-bit systems; the restrictions may be greater for 8-bit systems, and less on 16-bit systems with more than the minimum amount of memory. For example, the maximum record size in 8-bit systems is at least 4000 characters, while the maximum record size in 16-bit systems is at least 16,000 characters. In 16-bit systems, the constraints are unlikely to impose any serious limitations on record processing.

Date fields may be American or Australian format, as determined when the system is installed. Validation features which come with the system include checking ranges or specified values, and forcing entry of a field.

File creation and indexing

The process of preparing a file to be used in a Dataflex configuration includes defining its format and the indexes to be used to access it, specifying the maximum number of records it is to hold (although this can be changed subsequently), and, where appropriate, creating a screen form to use when entering and updating records. The simplest approach to this process is to use the Dataflex program AUTODEF, which uses a series of menus and questions to lead you through the whole process. The file definition can most easily be accomplished by creating a screen 'image' which can subsequently be used for data entry, and which contains titles, captions and field labels as required, plus indicators of the field positions and lengths. This involves typing underscores to show where the fields will be — three underscores indicate a three-character field, four underscores followed by a decimal point indicate a five-digit integer, and so on. This screen image may be prepared either with a word processor (such as WordStar in

BM1	Time to add one new record	3secs
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on three-character field (same field as in BM2 key)	56secs+
BM5	Time to access record using wild code	22secs+
BM6	Time to index 1000 records on three-character field	50secs
BM7	Time to sort 1000 records on five-character field	NA
BM8	Time to calculate on one field per record and store result in record	1min 43secs
BM9	Time to total three fields over 1000 records	1min 35secs
BM10	Time to add one new field to each of 1000 records	35mins 28secs

Time to import a file of 1000 records: 20mins 55secs

Notes: NT = Not tested NP = Not Possible += including scrolling
Where two times are given, first is access to first record, second is access to each subsequent record

Fig 2 Benchmark times recorded on an IBM PC/XT/hard

non-document mode) or with Dataflex's own simple editor, which gives paint-a-screen features using cursor and function keys.

When the screen image has been set up, you can then run AUTODEF. You will be asked to give the name for each field (Dataflex cannot pick this up from the captions used, even where they are to be the same), and to specify the index fields. Index keys may consist of up to six fields (four on 8-bit systems); all indexes must be unique, but can be made so by attaching the record number as the last field in a key, a procedure which would, in practice, for fields with duplicate values, reduce the number of data fields in a key by one. A file may have up to nine indexes (four on 8-bit systems) in addition to the record number; these are kept up-to-date as data is entered and amended.

In addition, you may have a single *ad hoc* index, which is created as it is needed and need not be specified at this point so that it can be used to order the file in further ways for reports. Where two or more files are to be linked together, the relationships are based on indexes whose fields must be identical in type and size in the related files.

When indexes have been specified, you cannot change the specification without re-indexing either on the one key which has been changed, or on the whole set; this process is reasonably fast (see Fig 2 for Benchmark times). To change the format of the record without writing a Dataflex program involves copying the data file twice; you use Query to create a plain text version of the file, then use a Dataflex utility, FILEDEF, to amend the record format, and finally use another Dataflex utility, READ, to create a configuration to re-import the data into the new format. FILEDEF provides an alternative route for setting up and amending the formats of data files and indexes, which gives more control over the process than the automated route via AUTODEF.

Data input and updating

If you use the AUTODEF program to set up your files, it will automatically create the necessary program to allow you to enter and amend records. This allows you to add new records, to amend records retrieved by any key, and to delete records. The Enter supplied macro provides a more sophisticated approach to the same requirement, giving you the ability to have programs set up which carry out command processing within the data entry phase (for example, to supply calculated fields), and which include data from more than one file on a single screen image. You cannot, though, use ENTER to specify that several records be displayed for amendment on a single screen. For this kind of option you must set up a configuration yourself, or amend one created initially with ENTER.

Often in a more complex system you will want to automatically carry out certain updating operations — perhaps to summarise and archive records at the end of a month or year. This kind of 'batch' updating can be carried out by writing your own configuration, using Dataflex commands.

Screen display

The screen images which can be created for data entry and amendment have already been described. When records are retrieved in this way, you can scroll through them in order by the current index (that used to retrieve the record), using keys which request 'next' or 'previous' record. For reporting, you can use the Query facility which displays one record per line, and which allows you to determine the fields to be displayed but does not give you any control over formats. Output from the Report macro can be directed to the screen. You can use Dataflex's extensive repertoire of display commands to provide precise control over screen displays. These commands include the ability to show complete lines, and to place particular data at specified points on the screen using direct cursor control.

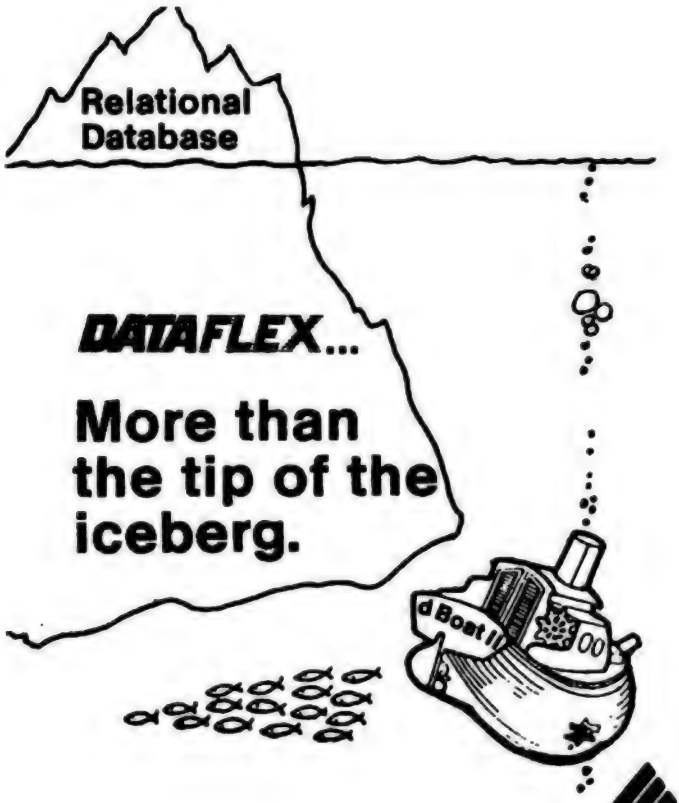
Printed reports

Simple printed reports can be produced using the Query facility, which permits output to the screen, a printer, or a file. More sophisticated formatting is provided by the Report macro, which allows you to specify a report with header and sub-header, body, sub-total and total sections. Nine levels of sub-totals are available, as well as overall totals. Formatting is achieved by including an image of the format the report is to take, linked to commands which dictate what is actually printed.

Reports created in this way may include information from more than one file. Where the Report macro does not provide sufficient flexibility, you can use direct output commands which provide similar facilities to those outlined under 'Screen display'.

Package	Cost($)	Summary
Dataflex	$1420 (single) $1880 (multi)	Powerful, flexible database management system available on a wide range of single-user and networked systems. Excellent for system developers, good for novices prepared to apply themselves. Clumsy manual, excellent reference summary and examples.
dBaseIII	$980	More advanced version of popular dBaseII package. Allows maximum 10 files open at once, which can be interrelated as you wish on a DIY basis. Flexible indexing. Command-based: can store sets of commands to get close to programming. Only on IBM PC and clones.
KnowledgeMan	$950	Powerful data management system, few software limits on processing. Spreadsheet included, word processing and business graphics as add-ons, all loosely integrated. Features for experienced users and system developers excellent, rather complex for novices.
Sensible Solution	$950 (single) $1450 (multi)	Powerful multi-user, multi-file system based on central data dictionary which holds all record definitions. Menu-driven for beginners but no default formats, so lots of work to do to get started. Tailoring powerful but tedious to implement.
Sycero	$1390	Powerful and flexible program generator, with good facilities for screen handling and processing, powerful command language, ability to incorporate Basic statements if desired. Rather complex for novices, better for software developers.

Fig 3 Comparison of similar data management packages



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Selection & sorting

The Query facility allows you to select on a maximum of 10 criteria. If you want to select records which match one of several values on a single field, each test counts as a selection, but they are, of course ORed: that is, the record is selected if any one such test is passed. Selections on separate fields are ANDed: that is, only records which pass them all are met. You could therefore issue a selection which requested all those whose postcode shows that they live in Mosman or Paddington, and have blue eyes and fair hair.

When using the Report macro, you can request that tests be ANDed or ORed, or that records pass if a test is *not* true. All these tests can use the conventional range of comparison operators (less than, greater than, and so on) plus a 'containing' test for character fields. If these facilities are insufficient, there is a range of commands to carry out tests, including an IF . . . ELSE group.

No sorting facilities are provided; Dataflex allows you to order data using indexes. Most of these will be specified when the file is first defined, and if the specification is changed then the file must be re-indexed. A single temporary index is provided which can be set up on an *ad hoc* basis for particular reports; this saves having to alter the file definition simply to have a report printed in a particular order. It also saves the extra processing and space overheads of additional indexes.

Calculation

Dataflex provides three commands which aid calculation: MOVE (which allocates values to variables and fields); INCREMENT (which adds one to the value of a field or variable); and CALCULATE (which allows you to enter a simple arithmetic statement to carry out calculations on field or memory variables). Any variables (as distinct from fields in stored records) must be explicitly defined in the Dataflex program.

Multiple files

Many of the Dataflex facilities relating to multiple files have already been mentioned, including the ability to explicitly relate files by defining the key fields which dictate the correspondence between records. For example, if you are programming an accounting system, the invoice file might have links to the customer file by customer account code, and to the stock file by stock item code.

This method is more constricting than that used by many packages which construct relationships between files on an *ad hoc* basis, but equally this approach should make the development of more complex systems quicker and simpler.

At most points in the system, you can refer to fields from several related files. In configurations, fields are referred to by the convention 'filename.fieldname', rather than by providing a dictionary to all fields and requiring uniqueness of field names within a single database.

Tailoring

The full range of Dataflex commands allows you to program systems of a complexity comparable with those you can build in high-level languages such as Basic or Cobol. In fact, Dataflex is written in Pascal, and the approach of its command language is reminiscent of the flavour of Pascal itself (though without, I'm glad to say, the use of the dreaded semi-colon as statement separator). Space does not permit a full description of the facilities available, but they include some straightforward features for setting up simple control systems including menus for end users.

Quite sophisticated systems can be built from the basic building blocks which Dataflex provides, including the Enter and Report macros and the menu-building features, without the need to learn about Dataflex commands. Nevertheless, these commands do give system developers considerable power and flexibility to build configurations for other users. For example, Dataflex includes the ability to define your own commands, which can be executed with parameters, and to assign sets of commands to function keys through user-defined procedures. A surprising omission is the absence of any security features such as password protection for data files.

A number of firms has produced run-time system applications for both single and multi-user installations. Two accounting packages, one produced by Archives Computers Australia and another by a New Zealand company which is distributed in this country by Intelligence Australia, are both written for multi-user systems; and a range of applications software is available from Australian Microcomputer Solutions in Geelong.

Housekeeping

Dataflex allows you to delete, rename and copy files within the package, to access the directory listing, and to run operating system commands with return of control to the current menu.

Links with outside

You can read and write ASCII text files using Dataflex utilities (Read and Query respectively). The text files may use commas or carriage returns to delimit fields. For more complex formats Dataflex provides commands to read and write sequential text files, so you could construct virtually any format you need with a configuration of your own. Unlike the Dataflex facilities using internal file formats, the commands to handle sequential files are not particularly fast in operation.

User image

At the simplest level, Dataflex can be used as a menu-driven system for setting up simple files, and handling the entry and reporting of data. Most people, however, would not be willing to pay so high a price for a system which they could otherwise obtain for less than $500. To get value for money you really need to go beyond the basic features, and use at least the supplied macros for entry and reporting, plus the utilities for changing record definitions, setting up

Summary

Systems	80,86,MS,PC,MU
Version reviewed	2.1
Type	S,E
Features	Powerful multi-user, multi-file database management system. Full tailoring facilities for system developers. Maximum of nine indexes per file on 16-bit systems, kept up-to-date. Flexible screen display and reporting.
Drawbacks	All command sets must be compiled before use, so two-stage operation for everything except simple queries.
Ease of use	Quite good for experienced users (apart from need to compile). Macros and menus for novices, but still complex.

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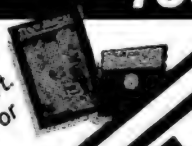

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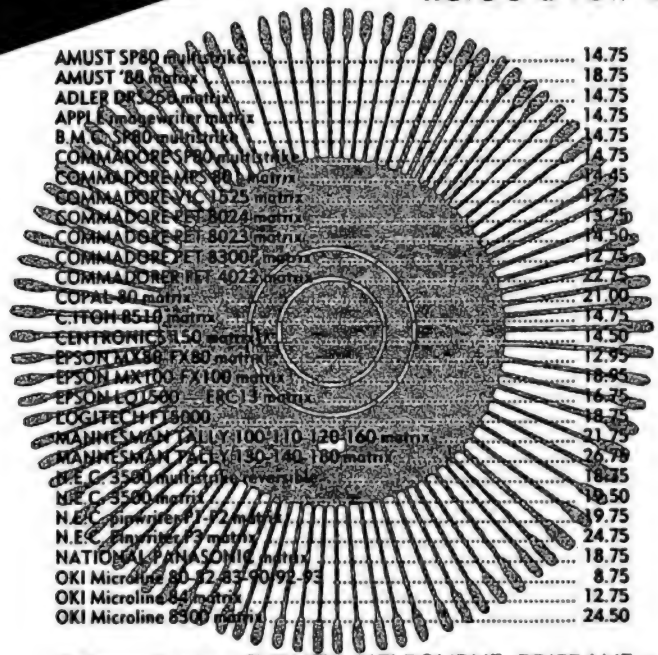

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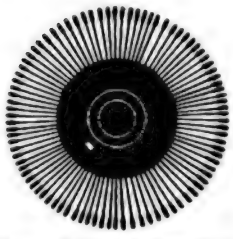

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menus, and so on. I was able to run all the Benchmarks save two with this approach, and I found the system quite easy to use. For example, to import the Benchmark file I used the Read utility, which sets up an appropriate configuration to import a text file into a predefined database file. This process rarely works first time, but on this occasion it did.

Beyond these supplied programs and utilities, you need to use the range of Dataflex commands, and may need to go on to use procedures and to reset the function keys. I found programming with Dataflex quite straightforward, and both the programs to run Benchmarks compiled and ran correctly first time. As with setting up screen images, I found it best to use my word processor to construct program source files and then re-invoke Dataflex — the package allows you to compile files from other directories, so that is relatively problem-free.

Dataflex would be even easier to use if, instead of key stickers to display the standard uses of the function keys — to carry out operations such as Find a record, Save a record or Query a definition — the package were provided with a template. You cannot make use of more than one set of stickers, so anyone who uses more than one package which does not have a template is stuck!

Documentation

The Dataflex documentation is both an aid and a hindrance to understanding. The package comes with a manual, a reference summary and a set of example configurations. I suspect that most experienced users would do better to use the reference summary (which is one of the best I've seen and includes a complete syntax definition of all commands), together with the example configurations, and largely ignore the manual. This is a curious mixture of the tutorial level and the terse reference style,and explains the Dataflex features in a very curious order. It is more useful if used purely for reference, using the reference summary as a kind of index (there is an index to the manual, but I didn't find it very helpful). This is perfectly feasible, as the reference summary has a feature I've often recommended but (I think) never before seen, and that's a reference to the page in the manual for every command.

Conclusion

Dataflex is a powerful and flexible system, available on a very wide range of both single and multi-user micros. It provides extensive facilities for relatively inexperienced users, as well as advanced tools for system developers. It is about as easy to use as a system of this power can be, but as you would expect, people with little experience will get the most out of the system only by undertaking a couple of days' formal training.

That said, I feel that on balance, Dataflex represents one of the best chances for users with enthusiasm and a little experience to get worthwhile results from a powerful database management system. For them and for experienced users, the breadth of function, combined with the availability of a run-time system which includes the relatively powerful Query facility, and the absence of copy protection, must make Dataflex well worth considering.

For some people, the constraints imposed by the need to compile source code before executing sets of commands will be a drawback, but it should be set against the potential improvements in performance which may be achievable with a compiled system. Where this last is a consideration, you should make sure you carry out some timing tests for yourselves. My Benchmarks suggest that Dataflex is considerably faster than most, but not all, of its competitors.

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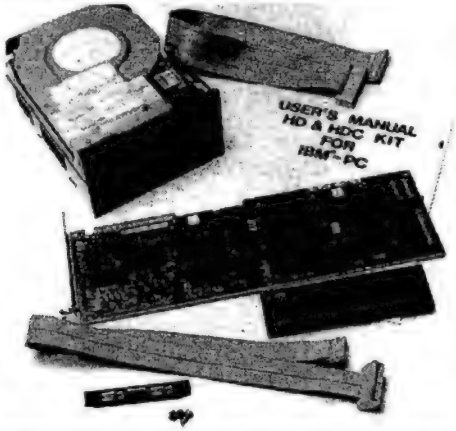

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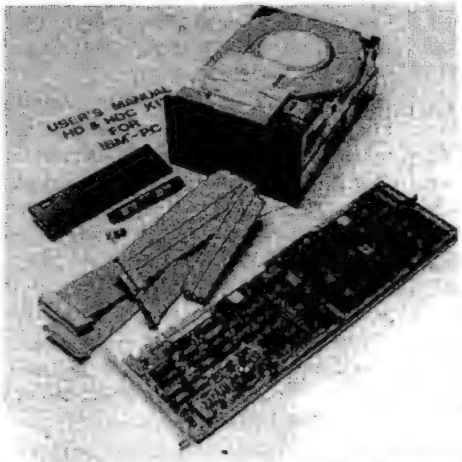

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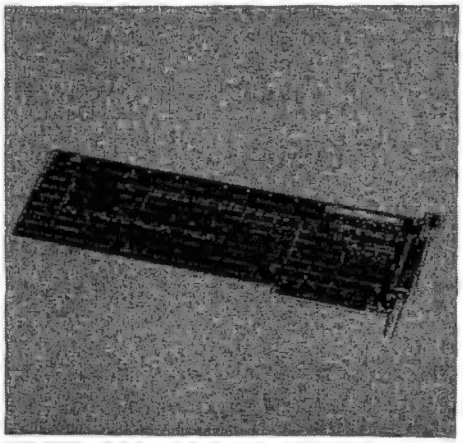

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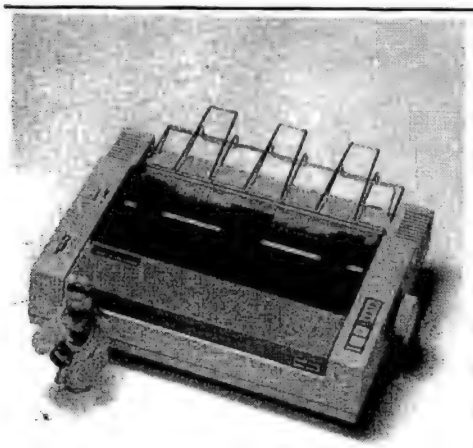

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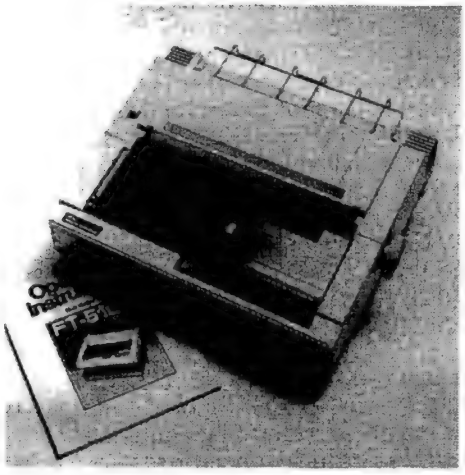

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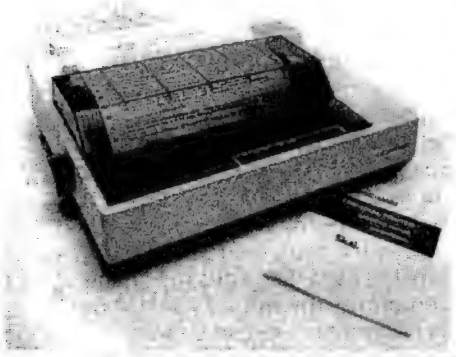

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Logo lists

Harvey Mellar continues his Teach Yourself series with a look at Logo list processing.

In its very earliest form Logo didn't have any graphics, and was exclusively concerned with 'list processing'. In fact, turtle graphics was originally thought of as a sugar coating useful for introducing programming to students, rather than as an end in itself.

In this article I'll explain what list processing is, and why it's important. There are other languages that are based around list processing — Lisp is the most well-known example, but Logo provides the easiest and best introduction to the topic.

To show how lists are used, I'll apply them to the task of developing the basic commands of a text adventure game. Lists have much wider applications than this, and future articles will explore other possibilities.

What is a list?

In Logo there are only two kinds of objects — 'words' (numbers are included in this category) and 'lists'. A list can be defined as 'an ordered collection of objects'. We mark the fact that something is a list by enclosing it within square brackets, so [SWORD KNIFE BAG STONE JEWEL] is a list, it is made up of five words. The word 'ordered' occurs in our definition because [JEWEL BAG SWORD KNIFE STONE] would be a different list from [SWORD KNIFE BAG STONE JEWEL]: the order matters.

Lists are important because they can be used to represent many different types of data. The aforementioned list was the inventory of an adventurer during an adventure game; the list [X = Y * Y] represents a mathematical formula; the list [TO BE OR NOT TO BE] represents a line of prose.

I said that a list was a collection of objects, not just of words, although the examples so far have been lists of words. A Logo object, remember, is either a word or a list, so our list could be a collection of lists. [[EDDY GRUNDY] [HOWQUA FARM] [CREMORNE]] is a list of three lists, and it represents an address.

A more complex example is [[:SIDE] [REPEAT 4 [FORWARD :SIDE RIGHT 90]]]. This is a list of two lists: the first list consists of one word; the second list consists of two words together with a list (which in turn consists of four words). This list represents a Logo procedure for drawing a square.

These few examples should give you some idea of how useful lists can be for representing data. Logo provides a few simple primitives for manipulating lists, and with these you can write powerful programs working on complex structures of symbols.

A list (unlike an array in Basic) is not of any defined length, so you can add elements to it at any time until all the available memory in the workspace has been used up.

The Logo procedures using lists that we are going to develop could have been written in very different ways using Basic or assembly code, but using lists makes it easier to represent the data; this makes the data easier to think about, which in turn makes programming easier.

Taking lists apart

The basic operations for taking lists apart in order to examine them are FIRST and BUTFIRST.

FIRST [SWORD KNIFE BAG STONE JEWEL] returns SWORD, the first element of the list.

BUTFIRST [SWORD KNIFE BAG STONE JEWEL] returns [KNIFE BAG STONE JEWEL], the list without its first element.

One command needed in any adventure game is one to print out everything in the adventurer's possession — let's call this command INV for INVentory. We'll keep the possessions as a list, and assign it to the variable INVENTORY:

```
MAKE "INVENTORY [SWORD KNIFE BAG STONE JEWEL]
```

We could then define INV as follows:

```
TO INV
  PRINT [YOU ARE CARRYING]
  PRINT :INVENTORY
END
```

If the adventurer does not have anything in his possession, then the line PRINT :INVENTORY prints a blank line; the list INVENTORY is said to be 'empty' and its value is represented as []. Logo provides an operation to test for this — EMPTY? (EMPTYP in LCSI versions). Using this we can now improve on our procedure:

```
TO INV
  PRINT [YOU ARE CARRYING]
  TEST EMPTY? :INVENTORY
  IFTRUE PRINT [NOTHING]
  IFFALSE PRINT :INVENTORY
END
```

For some purposes it might be nice to have the possessions printed one under the other rather than along the same line. To do this, we need to replace the PRINT in the last line with a new procedure, PRINTVERT:

```
TO PRINTVERT :LIST
  PRINT FIRST :LIST
  PRINTVERT BUTFIRST :LIST
END
```

This procedure prints the first element of the list and then recursively calls itself, with the list minus its first element as its input. This causes each word to be printed one below the other. However, when the procedure gets to the end of the list, FIRST tries to find the first element of the empty list [], but there is no first element so Logo gives an error message. To overcome this problem, add a 'stop rule' to the recursive procedure:

```
TO PRINTVERT :LIST
  IF EMPTY? :LIST THEN STOP
  PRINT FIRST :LIST
  PRINTVERT BUT FIRST :LIST
END
```

PRINTVERT follows a pattern that is very common in recursive procedures. Compare it with this procedure which counts down from the input number to 0:

```
TO COUNTDOWN :NUMB
  IF :NUMB = 0 THEN STOP
  PRINT :NUMB
  COUNTDOWN :NUMB – 1
END
```

This procedure does not use list

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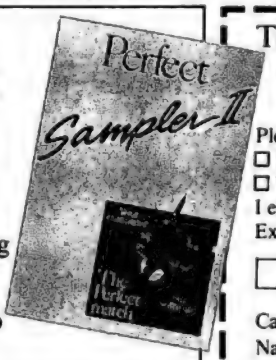

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processing, but it shares the same pattern as PRINTVERT:
1) Test to see if the procedure is complete, if so then stop.
2) Deal with the easy case.
3) Call the procedure recursively to deal with a slightly simplified case.

This pattern is particularly common in list processing programs. It should not be surprising that many list processing programs use recursion, for even our definition of a list was recursive. Remember — we defined a list as a collection of objects, and yet we said an object was a word or a list!

Putting lists together

FIRST and BUTFIRST enable you to take lists apart, to discover what is inside them. If you want to build up a list, the basic operation to use is FPUT:
FPUT "DAGGER [SWORD KNIFE BAG STONE JEWEL] returns the list [DAGGER SWORD KNIFE BAG STONE JEWEL].

Let's continue with the example of an adventurer's inventory. At the start of a game he would have nothing: MAKE "INVENTORY []. As he finds objects, he may choose to pick them up and keep them. Let's define a word GET, so that he can give commands such as GET "SWORD. Here's our first attempt:

```
TO GET :OBJECT
  MAKE "INVENTORY FPUT :OBJECT
    :INVENTORY
END
```

The trouble with this definition is that it does not check to see if the object is actually present in the room for the adventurer to pick up. One way to deal with this is to have a variable, let's call it CONTENTS, which contains a list of all the objects in the room. To find out whether an object is present we would then need to see if it was in the list CONTENTS, so what we really need is a procedure that checks whether an object is in a list. Most versions of Logo include a primitive, MEMBER? (or MEMBERP), that does just this, but it is instructive to see how it could be defined:

```
TO MEMBER? :OBJ :LIST
  IF EMPTY? :LIST THEN OUTPUT
    "FALSE
  IF :OBJ = FIRST :LIST THEN OUTPUT
    "TRUE
  OUTPUT MEMBER? :OBJ BUTFIRST
    :LIST
END
```

This procedure works down the list, checking each element in turn until it either finds a match or comes to the end of the list. It returns either the TRUE or FALSE value which can be used as the input to an IF, in Pascal terms MEMBER? is a Boolean function. We can now test whether an object is present:

```
TO PRESENT? :OBJECT
  IF MEMBER? :OBJECT :CONTENTS
    THEN OUTPUT "TRUE ELSE OUT-
    PUT "FALSE
END
```

With PRESENT? we can write an improved version of GET:

```
TO GET :OBJECT
  TEST PRESENT? :OBJECT
  IFTRUE MAKE "INVENTORY FPUT
    :OBJECT :INVENTORY
  IFFALSE PRINT [I CAN NOT SEE]
    PRINT :OBJECT
END
```

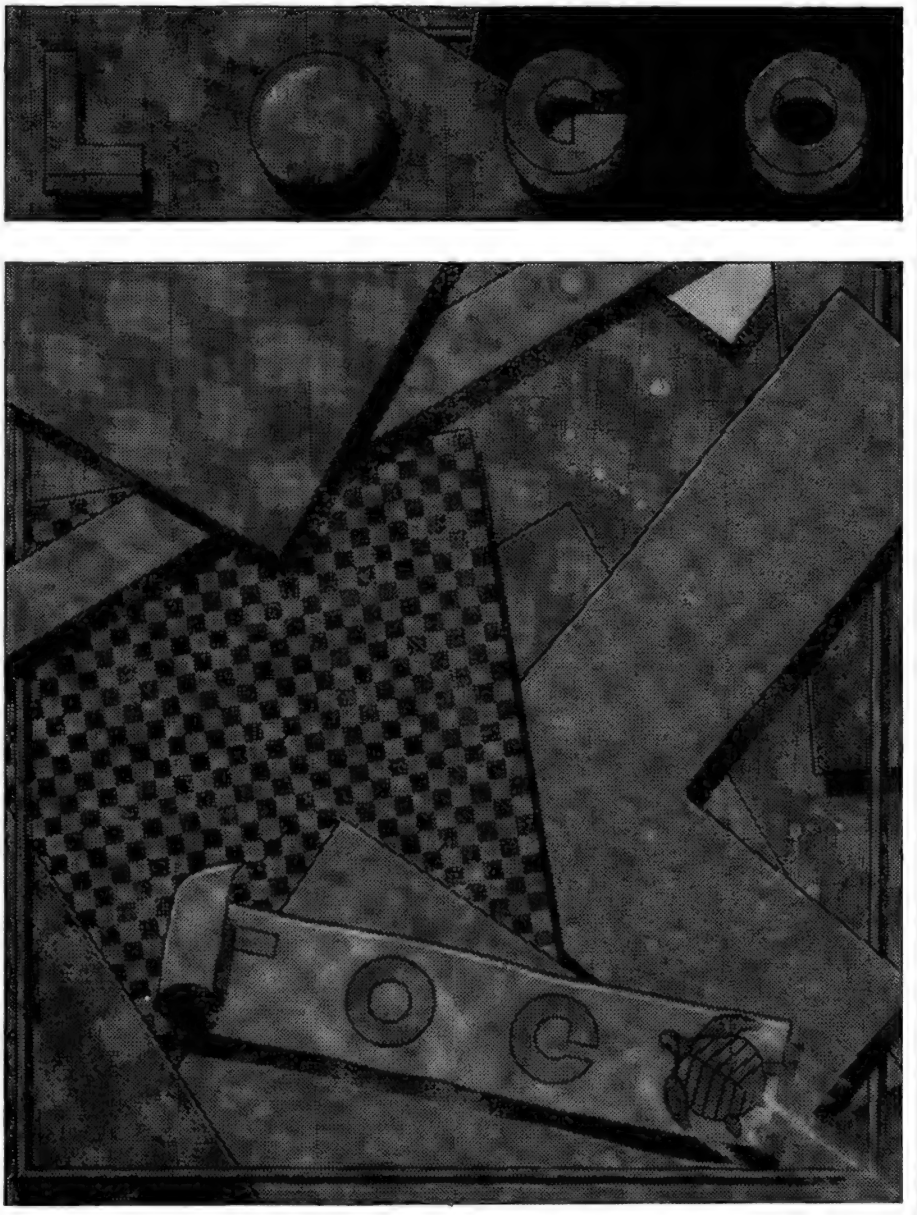
So much for picking up objects, but if our adventurer wishes to get rid of some of his possessions and put them down, we'll need a word PUT; he can therefore say PUT "SWORD.

```
TO PUT :OBJECT
  TEST MEMBER? :OBJECT :INVEN-
    TORY
  IFTRUE MAKE "INVENTORY DELETE
    :OBJECT :INVENTORY
  IFFALSE PRINT [YOU DON'T HAVE
    IT!]
END
```

That's a nice, simple definition, the only trouble being there is no primitive called DELETE. Here's how we might define DELETE in order to remove an element from a list:

```
TO DELETE :ITEM :LIST
  IF EMPTY? :LIST THEN OUTPUT []
  IF :ITEM = FIRST :LIST THEN OUT-
    PUT BUTFIRST :LIST
  OUTPUT FPUT FIRST :LIST (DELETE
    :ITEM BUTFIRST :LIST)
END
```

It is worth looking closely at this procedure for while it is short it is



powerful, and illustrates a number of basic principles about writing list processing procedures. Notice that it is an operation: it outputs the value of the list without the given element. The three steps of the procedure translate into English as follows:

1) If the input list is empty it is not possible to remove anything, so output the empty list.

2) If the first element of the list is the object we are trying to remove, output the rest of the list without that first element.

3) Otherwise, output a list made by putting the first element at the front of the list you would get by removing the element to be deleted from the rest of the list.

The procedure works because step three is slighly easier than the original problem — the input list is one element less.

Lists of lists

So far we have kept our inventory as a simple list of words, but it might be useful in some games to have a more complex data structure.

If the game allocated a score according to the items in the adventurer's possession, then INVENTORY could consist of a list of lists, each sub-list consisting of the object's name together with its value. For example:

```
MAKE "INVENTORY [[SWORD 20] [KNIFE 10] [BAG 5] [STONE 2] [JEWEL 100]]
```

It is useful to define procedures which pick out the individual parts of the list. These procedures don't do anything very important, they simply enable us to write slightly more meaningful higher-level procedures:

```
TO NAME :ITEM
  OUTPUT FIRST :ITEM
END

TO VALUE :ITEM
  OUTPUT FIRST BUTFIRST :ITEM
END
```

So NAME [STONE 2] returns STONE and VALUE [STONE 2] returns 2.

In order to print out the inventory using INV, PRINTVERT would now need to be rewritten as:

```
TO PRINTVERT :LIST
  IF EMPTY? :LIST THEN STOP
  PRINT NAME FIRST :LIST
  PRINTVERT BUTFIRST :LIST
END
```

Assuming that our game only awards points for possessions, SCORE will print out the adventurer's score:

```
TO SCORE
  PRINT SCORE1 0 :INVENTORY
END

TO SCORE1 :SUM :LIST
  IF EMPTY? :LIST THEN OUTPUT :SUM
  OUTPUT SCORE1 ( :SUM + VALUE FIRST :LIST ) BUTFIRST :LIST
END
```

In this procedure, notice the way in which the value of the sum is built up. It is passed on at each recursive call, and eventually returned as the value of the operation.

Describing the room

We've discussed the adventurer's possessions, but the rooms could also be represented as lists. Here's a possible room:

Name: room2.

Description: this is a dark room about 20 feet square; exits: north to room 5 and south to room 8.

Contents: sword, bottle.

One way to represent this information is to define a variable ROOM2:

```
MAKE "ROOM2 [[THIS IS A DARK ROOM ABOUT 20 FEET SQUARE] [[N ROOM5] [S ROOM8]] [SWORD BOTTLE]].
```

We could then do the same thing for each of the other rooms in the game. In order to keep track of where the adventurer is, we need a global variable HERE that contains the name of the room the adventurer is in at the time. We might begin with MAKE "HERE "ROOM2.

Having represented the data as lists, we now need to write some words to extract the various parts of the data, particularly the description, the contents and the exits. It is more convenient for some of these procedures to work from the end of the list rather than from the beginning. Logo provides three primitives, LAST, BUTLAST and LPUT, which correspond to FIRST, BUTFIRST and FPUT, differing only in that they work from the end of the list rather than from the beginning.

```
DESCRIPTION "ROOM2 outputs the description of the room.
TO DESCRIPTION :ROOM
  OUTPUT FIRST THING :ROOM
END
CONTENTS "ROOM2 outputs the list of contents of the room
TO CONTENTS:ROOM
  OUTPUT LAST THING :ROOM
END
EXITS "ROOM2 outputs a list of directions in which you can go from that room.
TO EXITS :ROOM
  OUTPUT GETEXITS [] FIRSTBUTFIRST THING :ROOM
END

TO GETEXITS :EXITS :EXITSLIST
  IF EMPTY? :EXITLIST THEN OUTPUT :EXITS
  OUTPUT GETEXITS (FPUT ' (FIRSTFIRST :EXITLIST) :EXITS)
BUTFIRST :EXITLIST
END
```

GETEXITS takes the list from the room details, for example [[N ROOM5] [S ROOM8]], assigns it to EXITLIST and builds up a list of the possible exits in EXITS which it finally outputs — here [NS].

We can put these three together into a word LOOK which prints out what we can see at the time.

```
TO LOOK
  PRINT DESCRIPTION :HERE
  PRINT [YOU CAN SEE]
  PRINT CONTENTS :HERE
  PRINT [YOU CAN GO]
  PRINT EXITS :HERE
END
```

These procedures could be used in other parts of the game: for example, EXITS might be used to check on valid moves. The command to move north will be MOVE "N, where MOVE is defined as follows:

```
s MOVE "N.
TO MOVE :DIR
  TEST (MEMBER? :DIR EXITS :HERE)
  IFTRUE MOVEIT :DIR
  IFFALSE PRINT [YOU CAN'T GO THAT WAY]
END
```

MOVE simply checks that the move is valid; if it is, then it passes the work over to MOVEIT. Write MOVEIT yourselves — it must go down the exit list in the room description, find out which room lies in the moved direction, and then set the value of HERE to the new room name.

As a final example, consider the problem of altering a room description: for example, updating the room's contents if an object is PUT down. PUT would have to include a call to ADD:

```
TO ADD :OBJECT
  MAKE :HERE LPUT (FPUT :OBJECT CONTENTS :HERE) (BUTLAST THING HERE)
END
```

To understand how this works, let's assume that the value of HERE is ROOM2; MAKE :HERE then becomes MAKE "ROOM2. The value to be assigned to ROOM2 is what we get by putting FPUT :OBJECT CONTENTS :HERE in place of the last item in the list. What is FPUT :OBJECT CONTENTS :HERE? It is a list made up by putting the new object at the front of the old contents list for ROOM2, which is precisely what we wanted.

This is part three of a six-part series. END

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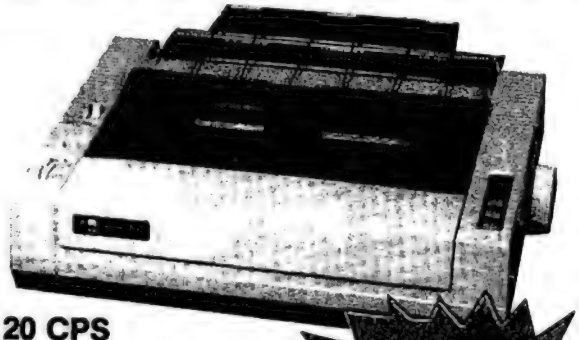

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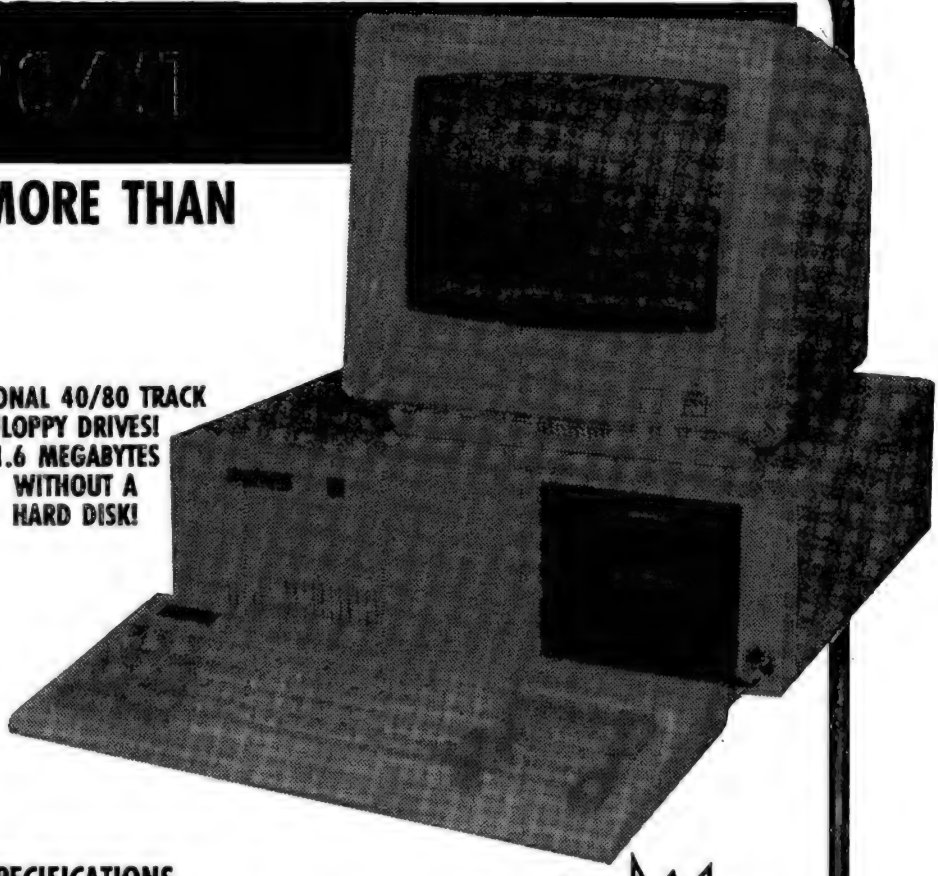

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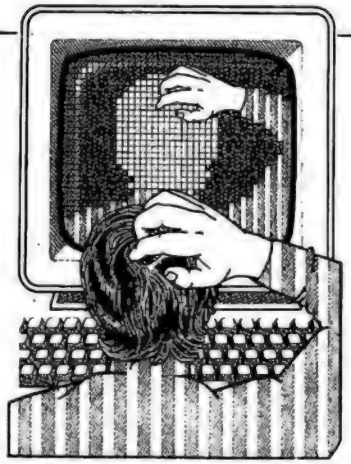

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CHALLENGER BASIC-A PATCH

Strange as it may seem, the Microsoft Basic-A interpreter for 8088 and 8086 based machines is not a single product, but differs from machine to machine. Microsoft sells its interpreter to a large number of computer manufacturers, and each manufacturer configures it to suit its own machine. This can lead to inconsistencies.

When Basic-A is called on the IBM PC, the screen attributes are stored before loading Basic. This means that when you leave Basic-A, your set-up returns to what it was originally.

The implementation on Dick Smith's Challenger does not work this way. On entering and exiting Basic-A, the computer is set to 40-column mode. Switching to 80-column mode could be done using the SET command at system level or the WIDTH command in Basic, but for continuous editing, debugging and checking this becomes tedious and time-consuming. For example, if a Basic-A file is being edited using WordStar and is checked using the Run option, on return to WordStar, the screen is set to 40-column width which looks very odd.

Two small patches to Basic-A are provided to get around this problem. The first ensures that on entering Basic-A you go into 80-column mode, and the second ensures the same on exit.

Copy the files BASICA.EXE and DEBUG.COM onto a new disk; this is essential in case something goes wrong with the modifications. Now log into the disk drive containing the new disk. Rename the file BASICA. EXE as TEMP, as the DEBUG program will not write a file with the. EXE extension. Do this by typing: RENAME BASICA. EXE TEMP (return)

Now call up DEBUG to alter the contents of TEMP. Type the sequence exactly as shown here (spaces are significant and should be included):

```
DEBUG TEMP (return)
E2139 50 (return)
E210D 31 D2 B4 01 88
  26 5C 06 (return)
E2115 CD 17 B8 03 00 CD
  10 (return)
W (return)
(A Message is displayed
  saying 'Writing E800
  bytes')
Q (return)
```

You should now see the system prompt of A> or B>. The next step is to rename the file TEMP to its original BASICA.EXE with the command:

```
RENAME TEMP BASICA.
  EXE (return)
```

Now test that the changes you have made work by typing BASICA. Basic should load and run in 80-column mode.

When you are sure that the first patch works, follow these steps to install the second patch to make the Challenger revert to 80-column mode after leaving Basic-A;

```
RENAME BASICA. EXE
  TEMP (return)
DEBUG TEMP (return)
E226C B0 02 90 90 90
  (return)
W (return)
(A message is displayed
  saying 'Writing E800
  bytes')
Q (return)
```

You should now see the system prompt of A> or B> The value 02 refers to the colour burst' which should be disabled on some monochrome monitors, but if you are using a colour monitor, then change this term to 03 in the sequence to enable the colour burst.

Now rename the file:

```
RENAME TEMP BASICA.
  EXE (return)
```

and test the modified program.

John Lee and Carl Phillips

BBC FREE MEMORY DISPLAY

This program displays a constant count of free memory on the top right-hand side of the display while running and editing Basic programs in mode 7. The type of message it will display is '25672 bytes free'; this will remain in position even as the screen is scrolled due to the value being constantly updated with the frame synch 50 times a second. The machine code is stored in the user-defined character memory area, and when the Basic program is run, it can be saved as a machine code file. A CALL &COO command will start the display.

The program works by constantly calculating HIMEM-TOP and displaying the result. It is useful as a check during program development to see how much memory is used as variables and arrays are created, especially with long programs where economy of memory usage is essential.

L Durrant

```
 10 REM ********************************************************
 20 REM * A PROGRAM TO O/P A CONSTANT COUNT OF FREE MEMORY IN MODE 7 *
 30 REM *                                                      *
 40 REM *                  L.P.DURRANT -- MAY 1982             *
 50 REM ********************************************************
 60 *FX13,4
 70 FOR Addr%=&C00 TO &CB1
 80   READ Data%:?Addr%=Data%:Sum%=Sum%+Data%
 90   NEXT Addr%
100 IF Sum% <> 13907 PRINT "Data error":END
110 REM PROGRAM F0 TO DISPLAY, F1 TO STOP DISPLAY
120 *KEYOCALL&C00!M
130 *KEY1&FX13,4!M
140 MODE7
150 PRINT''"Press F0 to start the display."
160 PRINT''"Press F1 to stop the display."
170 END
180 DATA 169,110,133,116,169,12,133,117,169,26,141,32,2,169,12,141
190 DATA 33,2,169,14,162,4,32,244,255,96,173,85,3,201,7,240
200 DATA 1,96,24,173,80,3,105,20,133,114,173,81,3,105,0,133
210 DATA 115,56,165,4,229,18,133,112,165,7,229,19,133,113,160,1
220 DATA 177,116,145,114,136,192,8,208,247,32,98,12,24,105,48,145
230 DATA 114,136,165,112,5,113,208,241,169,135,145,114,136,169,140,14
240 DATA 114,96,162,16,169,0,6,112,38,113,42,201,10,144,4,233
250 DATA 10,230,112,202,208,240,96,32,66,121,116,101,115,32,102,114,101,10
```

VIC ROUTINES

This routine doubles the height of Vic-20 characters.

```
5REM LARGE LETTERS
10 FORI=1 TO 1024
20 B=PEEK (Y+32768)
30 POKE 5120+X,B
40 POKE 5121+X,B
50 X=X+2: Y=Y+1
60 NEXTI
70 POKE 36867, 155
80 POKE 36869, 253
90 PRINT CHR$(147)
```

The next two programs are for scrolling the Vic's screen. POKE 36864,X controls horizontal positioning of the screen, and POKE 36865,X controls vertical. The screen is initially set at horizontal — 12 and vertical — 38.

```
5 REM LEFT/RIGHT
10 FOR A=12 to 63
20 POKE 36864,A
30 FORT=1 TO 100:NEXTT
40 NEXT A
50 FOR A=63 TO 12 STEP
   — 1
60 POKE 36864,A
70 FORT=1 to 100: NEXTT
80 NEXT A
5 REM UP/DOWN
10 FOR A=38 TO 151
20 POKE 36865,A
30 FORT=1 TO 100:NEXTT
40 NEXT A
50 FOR A=151 TO 38
   STEP-1
60 POKE 36865,A
70 FORT=1 TO 100:NEXTT
80 NEXT A
```

Other POKEs are:

POKE 774,34: POKE 775, 253 — warm start if LIST occurs.

POKE 774,116: POKE 775,196 — syntax error if LIST occurs.

POKE 818,34: POKE 819, 253 — warm start if SAVE occurs.

POKE 818,116: POKE 819, 196 — syntax error if SAVE occurs.

POKE 816,34: POKE 817, 253 — warm start if LOAD occurs.

POKE 816,116: POKE 817, 196 — syntax error if LOAD occurs.

POKE 650,255 — key repeat.

POKE 650,64 — no key repeat.

POKE 198,0 — disables keyboard.

POKE 198,10: POKE 631, 131 — auto-load.

A Colclough

HI-RES SCREEN CLEAR

If you create a large array in Commodore 64 Basic and then CLR it, the interpreter will zero out anything in its path, including hi-res screen memory if it is in the way. If you have a hi-res screen within the limits of Basic variable space, just put this line at the beginning of your program.

```
clr: f=fre(0): dim a
   ((-65536*(+<0)+f)
   /5-10):clr
```

This will clear the screen within a second. You can't use it if screen memory is at $C000, but at the usual spot at $2000, and with Basic pointers set up normally, it works perfectly.

W Dimmlich

SMOOTH DISK

Here is a short two-liner for the Commodore 64 and a 1541 Disk Drive. This short program eliminates 'drive-knock' on the 1541, and can save it from going out of alignment. It can be added to game loaders to reduce the hair-raising rattle to a harmless flicker of the drive light.

```
1 OPEN 15,8,15 : PRINT#
   15, "M-W"CHR$(106)
   CHR$(0)CHR$(1)CHR$
   (133)
2 PRINT#15, "M-W"CHR$
   (7)CHR$(28)CHR$(1)
   CHR$(18) : CLOSE15
```

F Chu

WINDOW

A window showing part of the Apple HGR2 screen on the HGR screen can be achieved using the following program. The direction and speed of the window is controlled by paddle(1). NB: do not leave out or change anything as the program relies on exact timing and may not work if changed even slightly.

```
1  REM  - WINDOW BY GEORGE LAU -
2  POKE  - 16297,0
3  POKE  - 16302,0
4  POKE  - 16304,0
5  POKE  - 16300,0
6 I =  PDL (1): REM
7  POKE  - 16299,0
8  GOTO 5
```

For use with the keyboard, make the following changes:

```
0 X = - 16384:Z = -16368
6 ZZ = PEEK (X): POKE Z,A22
```

(Control-A will make the window move downwards at the fastest speed while <DEL> will make the window move upwards at the fastest speed. Other keys will give various intermediate speeds.)

A semi-transparent window can be obtained with the following changes

```
For joystick;
6 Z = PDL (1): FOR Z = 5
TO 20: NEXT
For keyboard;
6 ZZ = PEEK (-16384): FOR ZZ = 0
TO 6: NEXT : POKE - 16368,0
```

A radio-active window effect can be obtained by running the following program after loading a picture on the HGR screen. This program copies the picture on the HGR screen onto the HGR2 screen and then inverses it. Then run the semi-transparent version of Window.

```
10  REM  - COPY & INVERSE BY
    GEORGE LAU -
20  HGR2
30  POKE 60,0: POKE 61,32: POKE
    62,247: POKE 63,95: POKE 66,0
40  POKE 67,64: POKE 16376,160:
    POKE 16377,0: POKE 16378,76
50  POKE 16379,44: POKE 16380,254:
    CALL 16376
60  POKE 768,1: POKE 769,0: POKE
    770,4: POKE 771,0
70  POKE 772,45: POKE 773,0: POKE
    232,0: POKE 233,3
80  SCALE= 140: ROT= 0
90  FOR I = 0 TO 191: XDRAW 1 AT
    0,I: NEXT : TEXT
```

G Lau

THE CASE OF THE dISAPPEARING . . .

There must be other people who have been as frustrated as I have trying to operate the 'TAB' facility on the Amust 80DT printer. If I follow the program given on page 16 of the 'Micro Graphic Impact Dot Printer Operation Manual', not only do the words printed not appear in the correct 'tab' positions, but various letters are 'swallowed' as well!

This program listing appears to overcome the problem; basically it adds an extra CHR$(9) and a 'space' to the end of the line which sets up the tab positions. The only justification I have for doing this is that it works! Various trial-and-error sessions suggested that the space was necessary to avoid loss of leading letters, and in some sense to 're-set' the tab to begin a new line.

T Pepper

```
3  REM *TAB FOR AMUST 80DT*
5 D$ =  CHR$ (4): PRINT D$;"PR#1"
10  PRINT  CHR$ (27);"D"; CHR$ (5);
    CHR$ (10); CHR$ (21); CHR$ (0);
    CHR$ (9);" ";
15  REM  *THE QUOTE AT THE END OF
    LINE 10 MUST CONTAIN A SPACE!*
20  PRINT "ABC"; CHR$ (9);"DEF";
    CHR$ (9);"GHI"; CHR$ (9);"JKL"
30  PRINT D$;"PR#0"
```

VZ DELETIONS

The VZ-200 computer is a much more powerful machine than appears. Many of its facilities slumber because someone has made a marketing decision to restrict Basic access to certain facilities. Here is how one of them can be awakened.

DELETE is a Basic editing command that allows you to erase a block of Basic lines from a program in one go, instead of having to eliminate them one by one by entering each line number and pressing the return key.

Suppose, for example, you want to delete lines 250 to 530 from a program. Add this line to your program:

```
0 D250-530
```

Now enter the following commands and press the return key:

```
POKE31469,182:RUN
```

If you now list the program you will find the absence of all those lines you desire to be rid of. The content of line 0 will be invisible. Having accomplished your goal you can delete line 0 in the conventional way — enter 0 and press return.

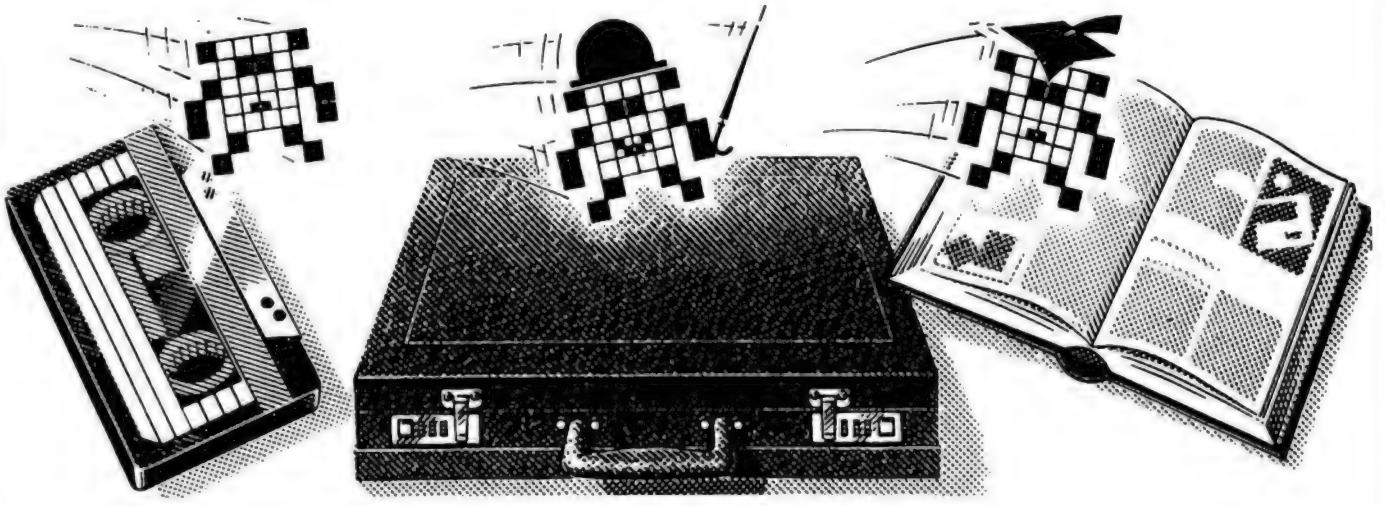
0 D-x where x is an end line number will, when the above POKE is made and the program RUN, eliminate all lines from the first line in the program (which of course will be line 0:) to line x.

On another matter, try this line:

```
10 FORR=5TO485STEP32:
   PRINT@R,"";:INPUTA:
   PRINT@R+16, "A=";A:
   NEXT
```

What it shows is that PRINT@ and INPUT statements will not work together on odd numbered lines (counting down the screen 0,1,2,...,16). A numerical INPUT will always return 0; a string INPUT will return the null string. So take care when programming with these two statements.

R Quinn



Owen Linderholm selects the best of readers' programs — for details on submitting your own, see the end of this section.

'By Gum!', BBC users have a good time of it this month with GUM, a graphics utility monitor by Brian Butterworth. This program is a Mac-alike aid for disk users, making the DFS user-friendly.

Continuing in this serious vein, there are disk-based databases for the Memotech and the Atari.

Commodore 64 users have a renumber utility that fits into a small space of unused memory, and will renumber all parts of a program including GOSUBs, and so on.

King Kong would not be happy about our game for the Spectrum, Not Another Kong!, which involves stealing his bananas.

Games

Scientific/mathematic

Business

Toolkit/utilities

Educational/Computer Aided Learning

Atari Database

by Martin Bann

This is a database for an Atari disk-based system with a minimum of 48k of memory. It is menu-driven and very user-friendly. The program comes in two parts. The first contains information about the database, and sets up machine code routines for sorting, searching and loading data. The second program is the database, and has the following functions:

CREATE — allows you to design the layout for the database.

ADD — lets you add new records to the database.

PUT — saves the current database to disk.

GET — loads a database file from the disk.

DISK — gives a directory of the disk.

SORT — sorts a file on a single field.

FIND — searches for any item, for example, a single letter, within a file.

PRINT — prints a selected range of records on the screen or a printer.

SPLIT — allows you to split a sorted file into two sections, if it grows too large to hold in memory.

To use, type in the two programs separately and save them onto the same disk as DBASEDAT.BAS and DBASE.BAS respectively. Then type RUN "D1:DBASEDAT.BAS".

```
10 REM Program name :- D:DBASEDAT.BAS
20 REM
30 REM This program must be run before       D:DBASE.BAS can be used.
40 REM
45 REM NOTE :- All ITALICS are to be typed in as INVERSE CHARACTERS
46 REM SYMBOL :- ) is (ESC) (CONTROL CLEAR)
47 REM <<<DO NOT REPEAT DO NOT TYPE IN THE REM STATEMENTS
48 REM AS THIS WILL REDUCE THE NUMBER OF RECORDS YOU CAN HAVE)>>>
50 OPEN #1,4,0,"K:":POKE 82,1:GRAPHICS 0:SETCOLOR 2,128,4:POKE 752,1:D=0
60 ? :? " This program will allow you to create   a database that can be used to
  store"
70 ? "  any data you like. Min 40K memory.":? :? " It has the following limitati
ons :-"
80 ? :? " 1 - maximum record width of 254 char."
90 ? " 2 - maximum header name of 38 char."
100 ? " 3 - maximum printer width, depends on       your type of printer."
110 ? " 4 - maximum of 15 fields."
120 ? " 5 - can only sort 1 field at one time"
130 ? " 6 - no control characters allowed as        data. (can be changed)"
140 ? " 7 - maximum number of records depends       on your record width."
150 ? :? " ie  with a record width of 100 char.       you can have 150 records.
"
160 ? :? "          press (RETURN) when ready":GET #1,KEY
200 ? "}    This program was designed by :-"
210 POSITION 14,2:? "MARTIN BANN"




255 ? :? "P.S. pressing (ESC) at any of the [--)       prompts will exit you from
  that      input routine."
260 ? :? " make sure you have a blank DOS disk."
270 FOR T=1536 TO 1784
280 READ A:POKE T,A:D=D+A:NEXT T
290 IF D<>38593 THEN ? "}ERROR IN DATA, PLEASE CHECK":END
300 ? :? " press (RETURN) to load 'D:DBASE.BAS' "
310 GET #1,KEY:RUN "D:DBASE.BAS":END
10000 DATA 104,201,4,240,30,201,5,240,115,162,32,104,157,69,3,104,157,68,3,104
10010 DATA 157,73,3,104,157,72,3,32,94,228,32,253,169,22,9,133,212,169,0,133
10020 DATA 133,213,96,104,133,204,104,133,203,104,133,206,104,133,205,104,133,20
8,104,133
10030 DATA 207,104,104,133,211,238,207,208,2,238,208,160,0,177,203,209,205,208,1
4,200
10040 DATA 196,211,208,245,165,210,133,213,165,209,133,212,96,238,203,208,2,238,
204,238
10050 DATA 209,208,2,238,210,165,210,197,208,208,216,165,209,197,207,208,210,169
,0,133
10060 DATA 212,133,213,96,104,133,214,104,133,213,104,133,204,104,133,203,104,13
3,209,104
10070 DATA 133,207,104,104,133,215,104,104,133,217,165,207,133,205,165,208,133,2
04,165,214
10080 DATA 133,212,133,210,165,213,133,211,24,101,203,133,209,165,210,101,204,13
3,210,165
10090 DATA 217,164,215,136,177,211,209,209,240,25,176,2,144,25,134,216,160,0,177
,211
10100 DATA 170,177,209,145,211,138,145,209,208,196,203,208,241,240,4,208,202,208
,221,198
10110 DATA 205,165,205,208,6,166,206,240,11,198,206,165,210,133,212,165,209,24,1
44,102
10120 DATA 165,216,240,4,134,216,208,150,96




1 REM ################################
2 REM # PROGRAM NAME :-D1:DBASE.BAS #
3 REM # BY :- MARTIN BANN  18-02-85 #
4 REM #                            #
5 REM # RUN D1:DBASEDAT.BAS before  #
6 REM # using this program.        #
7 REM ################################
8 GOTO 15000
9 REM # KEYBOARD INPUT ROUTINE
10 TEMP$="":X1=N1:X2=N1:Z=N1:Y1=PEEK(84)
20 POSITION N0,Y1:? "["|DASH$(N1,MAXLEN)|"]";:POSITION X1,Y1
30 GET #N1,KEY
40 IF (KEY<32 OR KEY>94) AND KEY<>27 AND KEY<>N155 AND KEY<>126 THEN 160
50 IF KEY=27 THEN TEMP$=E$:RETURN
60 IF KEY=N155 AND Z>N1 THEN TEMP$=TEMP$(N1,Z-N1):RETURN
70 IF KEY=N155 THEN 160
80 IF KEY<>126 THEN 120
90 IF X1=N1 AND X2=N1 THEN 160
95 IF X1<>N1 THEN 110
100 IF X2=N4 OR X2=7 THEN Y1=Y1-N1:X1=N39:X2=X2-N1:Z=Z-N1:POSITION X1,Y1:? "-"|C
HR$(254):POSITION X1,Y1:GOTO N30
105 Y1=Y1-N1:X1=N39:X2=X2-N1:Z=Z-N1:POSITION X1,Y1:? "-":POSITION X1,Y1:GOTO N30
110 X1=X1-N1:Z=Z-N1:POSITION X1,Y1:? "-":POSITION X1,Y1:GOTO N30
120 IF Z=MAXLEN+N1 THEN 160
125 IF X1<>N39 THEN 145
130 IF X2=N3 OR X2=N6 THEN POSITION X1,Y1:? CHR$(KEY)|CHR$(254):GOTO 140
135 POSITION X1,Y1:? CHR$(KEY)
140 TEMP$(Z,Z)=CHR$(KEY):Z=Z+N1:X1=N1:Y1=Y1+N1:X2=X2+N1:GOTO N30
145 POSITION X1,Y1:? CHR$(KEY):TEMP$(Z,Z)=CHR$(KEY):Z=Z+N1:X1=X1+N1:GOTO N30
160 SOUND N0,50,N10,N10:FOR DELAY=N1 TO N200:NEXT DELAY:SOUND N0,N0,N0,N0:GOTO N
30
199 REM # CLEAR A SELECTED PART OF THE SCREEN
200 FOR CLEAR=COUNT TO N22:POSITION N0,CLEAR:? SPACE$(N1,N38):NEXT CLEAR:RETURN
220 ? "}":? B$:? :? "You have to CREATE - LOAD a file first."
230 FOR DELAY=N1 TO 1500:NEXT DELAY:GOTO MENU
999 REM # ADDING OF RECORDS
1000 IF F1<>N1 THEN 220
1020 IF LEN(DAT$)+RDAT(N17))LE THEN 1240
1025 START=N0:TEMP=N5
1030 FOR T=N1 TO RDAT(N16):GOSUB 1900:? FIELD$(TEMP,TEMP+FDAT(T)-N1)
1040 TEMP=TEMP+FDAT(T)+N5:? :MAXLEN=RDAT(T):GOSUB KEYINPUT
1050 IF TEMP$<>E$ THEN 1080
1055 IF DAT$="" THEN 1070
1060 START=LEN(DAT$)-START:DAT$(START)=DAT$(START,START):IF LEN(DAT$))N1 THEN F2
=N1
1070 POP :GOTO MENU
1080 START=START+RDAT(T)
1090 IF LEN(TEMP$)<>MAXLEN THEN TEMP$(LEN(TEMP$)+N1)=SPACE$(N1,MAXLEN-LEN(TEMP$)
)
1100 DAT$(LEN(DAT$)+N1)=TEMP$:NEXT T
1109 REM # CHECK IF RECORD IS CORRECT
1110 ? "}        RECORD ENTRY CHECK":?
1120 START=LEN(DAT$)-RDAT(N17)+N1
1130 FOR T=N1 TO RDAT(N16):? DAT$(START,START+RDAT(T)-N1):START=START+RDAT(T):NE
XT T
1140 POSITION N4,N22:? "is above record correct (Y or N)":GET #N1,KEY
```

```
1150 IF KEY=N89 THEN 1200
1160 IF KEY<>N78 THEN 1140
1170 COUNT=N21:GOSUB SCLEAR:POSITION N1,N22:? B$;"please re-enter data for above
 record"
1180 FOR DELAY=N1 TO N500:NEXT DELAY:START=START-RDAT(N17)-N1:IF START=N0 THEN D
AT$="":GOTO 1025
1190 DAT$(START)=DAT$(START,START):GOTO 1025
1200 ? ")":POSITION N1,N10:? R$:? "                RECORD ADDED                ":? R$:
REM # ALL IN INVERSE
1230 FOR DELAY=N1 TO N255:NEXT DELAY:GOTO 1025
1239 REM # FILE FULL MESSAGE
1240 ? ")";) FILE FULL -no more records can be       added to this file."
1250 ? :? "Try splitting the file into two parts, and then use each part seperat
ely."
1260 ? :? "      press <RETURN> when ready":GET #N1,KEY:GOTO MENU
1900 ? ")          ADDING RECORDS"
1910 ? :? " file name      : ";FILE$
1920 ? " records to go  : ";INT((LE-(LEN(DAT$)-START))/RDAT(N17))
1930 ? :? " Press <ESC> to finish adding records":? R$
1950 ? :? " Please enter data for field number ";T:? :?
1960 RETURN
1999 REM # FIND/PRINT/MODIFY/DELETE  MENU
2000 IF F2<>N1 THEN 220
2020 ? ")":? :? :? "   Do you wish the printout to go to          SCREEN or PRINT
ER <S or P>";
2030 GET #N1,KEY
2040 IF KEY=N83 THEN PRT=N1:GOTO 2075
2050 IF KEY=N89 THEN PRT=N0:GOTO 2130
2055 GOTO 2030
2059 REM # CHECK IF PRINTER SWITCHED ON
2060 ? ")       PRINTER NOT SWITCHED ON":? :? "      press <RETURN> when ready":
GET #N1,KEY:GOTO 2020
2075 TRAP 2060:LPRINT
2080 ? ")":? :? :? "    Do you have a 40 colum printer          <Y or N>";
2090 GET #N1,KEY
2100 IF KEY=N89 THEN PRT40=N1:GOTO 2130
2110 IF KEY=N78 THEN PRT40=N0:GOTO 2130
2120 GOTO 2090
2130 ? ")":POSITION N1,N6:TEMP4=N0:F3=N0
2140 ? "    <P> PRINT whole file"
2150 ? :? "    <S> PRINT SELECTED part of file"
2160 ? :? "    <F> FIND a particular item"
2170 ? :? "    <M> MODIFY a record"
2175 ? :? "    <D> DELETE a record"
2180 ? :? "    <E> EXIT to main menu"
2190 ? :? :? "       PLEASE ENTER YOUR CHOICE"
2200 GET #N1,KEY
2210 IF KEY=N78 OR KEY=77 OR KEY=68 THEN 3000
2220 IF KEY=69 THEN GOTO MENU
2240 IF KEY=N80 THEN 2270
2250 IF KEY=N83 THEN 2600
2260 GOTO 2200
2269 REM # CHECK FOR DIFFERENT PRINT FORMATS
2270 IF PLEN(<=N40 THEN PRTCOL=N40:GOTO 2310
2280 IF PRT40=N1 OR PRT=N0 THEN PRTCOL=N40:GOTO 4700
2290 IF PLEN)N132 THEN PRTCOL=N80:GOTO 4700
2300 IF PLEN(<N80 THEN PRTCOL=N80:GOTO 2310
2305 PRTCOL=N132:LPRINT CHR$(N15):REM # SET PRINTER TO 132 COLUMNS
2309 REM # CUSTOM PRINT ROUTINE-COLUMN PRINT
2310 IF F3=N1 THEN ? ")":GOTO 2420
2320 ? ")":POSITION N15,N2:? FILE$:? :? DASH$(N1,N38):?
2330 IF PRT=N1 THEN TEMP=(PRTCOL-N8)/N2:LPRINT SPACE$(N1,TEMP);FILE$:LPRINT :LPR
INT DASH$(N1,PRTCOL):LPRINT
2340 TEMP1=N5:TEMP$=""
2350 FOR T=N1 TO RDAT(N16)
2360 IF PRTCOL<>N40 THEN ? FIELD$(TEMP1,TEMP1+FDAT(T)-N1)
2370 TEMP$(LEN(TEMP$)+N1)=FIELD$(TEMP1,TEMP1+FDAT(T)-N1):TEMP1=TEMP1+FDAT(T)+N5
2380 IF FDAT(T)<RDAT(T) THEN TEMP$(LEN(TEMP$)+N1)=SPACE$(N1,RDAT(T)-FDAT(T))
2390 TEMP$(LEN(TEMP$)+N1)=" ":NEXT T:IF PRTCOL=N40 THEN ? TEMP$
2400 ? :? DASH$(N1,N38):? :IF PRT=N1 THEN LPRINT TEMP$:LPRINT :LPRINT DASH$(N1,P
RTCOL):LPRINT
2420 IF TEMP4=N0 THEN START=N1:FINISH=(LEN(DAT$)/RDAT(N17)):RSTART=N1:TEMP=N1
2430 IF TEMP4=N1 THEN RSTART=((START-N1)*RDAT(N17))+N1
2440 FOR T1=START TO FINISH:TEMP$=""
2450 FOR T2=N1 TO RDAT(N16)
2460 IF PRTCOL<>N40 THEN ? DAT$(RSTART,RSTART+RDAT(T2)-N1)
2470 TEMP$(LEN(TEMP$)+N1)=DAT$(RSTART,RSTART+RDAT(T2)-N1)
2480 IF RDAT(T2)<FDAT(T2) THEN TEMP$(LEN(TEMP$)+N1)=SPACE$(N1,FDAT(T2)-RDAT(T2))
2490 TEMP$(LEN(TEMP$)+N1)=" ":RSTART=RSTART+RDAT(T2)
2500 NEXT T2:IF PRTCOL=N40 THEN ? TEMP$
2510 IF PRT=N1 THEN LPRINT TEMP$
2520 IF PEEK(N764)=28 THEN POP :GOTO 2550
2530 IF PEEK(N764)=33 THEN 2520
2540 NEXT T1
2550 IF PRT=N1 AND F3<>N1 THEN LPRINT :LPRINT DASH$(N1,PRTCOL)
2560 IF PRTCOL=N132 THEN LPRINT CHR$(N18):REM # RESET PRINTER TO NORMAL
2565 IF F3=N1 THEN RSTART=RSTART-RDAT(N17):F3=N0:GOTO 3010
2570 ? DASH$(N1,N38):GOTO 2020
2599 REM # SELECTED PRINT
2600 GOSUB 3000:TEMP=INT(X/RDAT(N17)):TEMP=TEMP*RDAT(N17)+N1
2610 GOSUB 3000:TEMP1=INT(X/RDAT(N17)):TEMP1=TEMP1*RDAT(N17)+N1
2620 IF TEMP)TEMP1 THEN 2640
2630 START=((TEMP-N1)/RDAT(N17))+N1:FINISH=((TEMP1-N1)/RDAT(N17))+N1:TEMP4=N1:GO
TO 2270
2640 START=((TEMP1-N1)/RDAT(N17))+N1:FINISH=((TEMP-N1)/RDAT(N17))+N1:TEMP4=N1:GO
TO 2270
2999 REM # FIND/PRINT/MODIFY/DELETE  ROUTINES
3000 GOSUB 3000
3005 TEMP=INT(X/RDAT(N17)):RSTART=TEMP*RDAT(N17)+N1
3010 TEMP=INT(RSTART/RDAT(N17))+N1:? ")Record # ";TEMP:?
3015 FOR T=N1 TO RDAT(N16)
3020 ? DAT$(RSTART,RSTART+RDAT(T)-N1)
3030 RSTART=RSTART+RDAT(T):NEXT T
3040 POSITION N3,N20:? "Print Mod Del Exit Next   #  +  - ";:GET #N1,KEY
3050 IF KEY=45 AND RSTART<N2*RDAT(N17) THEN 3220
3060 IF KEY=45 THEN RSTART=(RSTART-(N2*RDAT(N17))):GOTO 3010
3070 IF KEY=43 AND RSTART-N1=LEN(DAT$) THEN 3210
3080 IF KEY=43 THEN 3010
3090 IF KEY=68 THEN 3400
3100 IF KEY=N80 AND PRT=N1 THEN START=TEMP:FINISH=START:TEMP4=N1:F3=N1:GOTO 2270
3110 IF KEY=N80 THEN 3200
```

```
3120 IF KEY=69 THEN 2020
3130 IF KEY=77 THEN 3600
3140 IF KEY=78 THEN 3500
3150 IF KEY=N35 THEN 3300
3160 SOUND N0,N150,N10,N8:FOR DELAY=N1 TO N70:NEXT DELAY:SOUND N0,N0,N0,N0:POSIT
ION N12,N22:? "invalid key"
3170 FOR DELAY=N1 TO N200:NEXT DELAY:COUNT=N21:GOSUB SCLEAR:GOTO 3040
3199 REM * ERROR MESSAGES
3200 POSITION N6,N22:? "printer option not selected":GOTO 3250
3210 POSITION N5,N22:? "you are at the end of the file":GOTO 3250
3220 POSITION N4,N22:? "you are at the start of the file":GOTO 3250
3230 POSITION N9,N22:? "invalid record number":GOTO 3250
3240 POSITION N6,N22:? "no more items can be found"
3250 SOUND N0,N150,N10,N10:FOR DELAY=N1 TO N70:NEXT DELAY:SOUND N0,N0,N0,N0
3260 FOR DELAY=N1 TO N200:NEXT DELAY:RSTART=RSTART-RDAT(N17):GOTO 3010
3299 REM * GOTO A SPECIFIC RECORD *
3300 COUNT=N20:GOSUB SCLEAR:POSITION N12,N20
3310 TRAP 3230:? "Goto record  # ":? :INPUT TEMP
3320 IF TEMP<N1 OR TEMP>LEN(DAT$)/RDAT(N17) THEN 3230
3330 START=(TEMP*RDAT(N17)+N1)-RDAT(N17)
3350 RSTART=START:GOTO 3010
3399 REM * DELETION OF A RECORD
3400 COUNT=N20:GOSUB SCLEAR:POSITION N6,N22:? B$;"DELETE this record (Y or N)"$:
GET #N1,KEY
3420 IF KEY=N78 THEN RSTART=RSTART-RDAT(N17):GOTO 3010
3430 IF KEY<>N89 THEN 3400
3435 IF LEN(DAT$)=RDAT(N17) THEN ? B$;") FILE NOW EMPTY":FOR DELAY=N1 TO N200:NE
XT DELAY:DAT$="":F2=N0:GOTO MENU
3440 IF RSTART-N1=LEN(DAT$) THEN RSTART=RSTART-RDAT(N17):GOTO 3460
3450 DAT$(RSTART-RDAT(N17),LEN(DAT$)-RDAT(N17))=DAT$(RSTART,LEN(DAT$))
3460 DAT$(LEN(DAT$)-RDAT(N17))=DAT$(LEN(DAT$)-RDAT(N17),LEN(DAT$)-RDAT(N17))
3470 ? ")":POSITION N1,N10:? R$:? "              RECORD DELETED              ":? R$:
REM * ALL IN INVERSE
3490 RSTART=RSTART-RDAT(N17):FOR DELAY=N1 TO N500:NEXT DELAY:GOTO 3010
3499 REM * NEXT OCCURANCE OF AN ITEM SEARCH
3500 IF RSTART>LEN(DAT$) THEN 3240
3510 POKE 209,N1:POKE 210,N0:X=USR(1536,ADR(DAT$)+RSTART,ADR(TEMP$),LEN(DAT$)-RS
TART,LEN(TEMP$))
3520 IF X=N0 THEN 3240
3530 X=X+RSTART-N1:GOTO 3005
3599 REM * MODIFICATION OF A RECORD
3600 TEMP=N5:SPACE$="":START=RSTART-RDAT(N17)
3605 FOR T=N1 TO RDAT(N16):? ")":? "enter new data for :-":? :? FIELD$(TEMP,TEMP
+FDAT(T)-N1):? :?
3610 ? "previous data is :-":? :? DAT$(START,START+RDAT(T)-N1):TEMP=TEMP+FDAT(T)
+N5:? :?
3620 MAXLEN=RDAT(T):GOSUB KEYINPUT:IF TEMP$<>E$ THEN 3650
3640 ? ")":? :? :? " record NOT modified ":POP :GOTO 3720
3650 IF LEN(TEMP$)<>MAXLEN THEN TEMP$(LEN(TEMP$)+N1)=" ":GOTO 3650
3660 SPACE$(LEN(SPACE$)+N1)=TEMP$:START=START+RDAT(T)
3670 NEXT T:DAT$(RSTART-RDAT(N17),RSTART)=SPACE$
3690 ? ")":POSITION N1,N10:? R$:? "              RECORD MODIFIED             ":? R$:
REM * ALL IN INVERSE
3720 SPACE$=" ":SPACE$(N255)=" ":SPACE$(N2)=SPACE$:RSTART=RSTART-RDAT(N17)
3730 FOR DELAY=N1 TO N200:NEXT DELAY:GOTO 3010
3799 REM * SEARCH FOR A PARTICULAR ITEM
3800 ? ")  Enter data to search for                ie letter, word, sentence,\etc
":? :?
3810 ? "  press ESC to goto menu":? :?
3820 MAXLEN=RDAT(N17):GOSUB KEYINPUT:IF TEMP$=E$ THEN 2020
3830 POKE 209,N1:POKE 210,N0:X=USR(1536,ADR(DAT$),ADR(TEMP$),LEN(DAT$),LEN(TEMP$
))
3840 IF X<>N0 THEN X=X-N1:RETURN
3850 POSITION N3,N10:? "Item not found, please try again."
3860 ? :? "       press (RETURN) when ready":GET #N1,KEY:GOTO 3800
4099 REM * ION CUSTOM PRINT ROUTINE
4100 ? ")":? :? :? " Field names will only be printed at     the beginning of th
e file."
4110 ? " All records will then be printed in     that order."
4120 ? :? :? " Press    (ESC)    to exit to menu."
4130 ? :? " press (SPACE BAR) to HALT printing":? :? "     any other key to cont
inue."
4139 REM * IF F3=1 THEN DO NOT PRINT FIELD HEADINGS
4140 ? :? :? :? "       press (RETURN) when ready":GET #N1,KEY:IF F3=N1 THEN ? ")
":? :GOTO 4040
4150 ? ")":POSITION N15,N2:? FILE$:? :? DASH$(N1,N38):?
4160 IF PRT=N1 THEN TEMP=(PRTCOL-N8)/N2:LPRINT SPACE$(N1,TEMP);FILE$:LPRINT DASH
$(N1,PRTCOL):LPRINT
4170 TEMP=N5:FOR T=N1 TO RDAT(N16)
4180 ? FIELD$(TEMP,TEMP+FDAT(T)-N1)
4190 IF PRT=N1 THEN LPRINT FIELD$(TEMP,TEMP+FDAT(T)-N1)
4200 TEMP=TEMP+FDAT(T)+N5:NEXT T
4210 ? :? DASH$(N1,N38):? :? :IF PRT=N1 THEN LPRINT :LPRINT DASH$(N1,PRTCOL):LPR
INT :LPRINT :LPRINT
4220 FOR DELAY=N1 TO N200:NEXT DELAY
4230 IF TEMP4=N0 THEN START=N1:FINISH=(LEN(DAT$)/RDAT(N17)):RSTART=N1
4240 IF TEMP4=N1 THEN RSTART=((START-N1)*RDAT(N17))+N1
4250 FOR T1=START TO FINISH:FOR T2=N1 TO RDAT(N16)
4260 ? DAT$(RSTART,RSTART+RDAT(T2)-N1)
4270 IF PRT=N1 THEN LPRINT DAT$(RSTART,RSTART+RDAT(T2)-N1)
4280 RSTART=RSTART+RDAT(T2):NEXT T2:?
4290 IF PRT=N1 THEN LPRINT
4910 IF PEEK(N764)=28 THEN POP :GOTO 4940
4920 IF PEEK(N764)=33 THEN 4910
4930 NEXT T1
4939 REM * IF F3=1 THEN WE CAME FROM PRINT FUNCTION AT LINE 3040
4940 IF F3=N1 THEN RSTART=RSTART-RDAT(N17):F3=N0:GOTO 3010
4950 ? DASH$(N1,N38):IF PRT=N1 THEN LPRINT DASH$(N1,PRTCOL)
4960 POKE N764,N255:? :? "       press (RETURN) when ready":GET #N1,KEY
4970 GOTO 2020
4999 REM * SORT ROUTINE
5000 IF F2<>N1 THEN 220
5010 IF LEN(DAT$)=RDAT(N17) THEN ? B$;") Can only SORT 2 or more records.":GOTO
5090
5020 GOSUB 5300:START=N1:? ") Please wait..."
5040 FOR T=N1 TO TEMP:START=START+RDAT(T):NEXT T:START=START-RDAT(T-N1)
5050 X=USR(1536,ADR(DAT$),RDAT(N17),INT(LEN(DAT$)/RDAT(N17)-N1),START,RDA)(TEMP)
):POKE 82,N1
5060 ? ")":POSITION N1,N10:? R$:? "              FIELD SORTED                ":? R$:
REM * ALL IN INVERSE
```

```
5090 FOR DELAY=N1 TO N255:NEXT DELAY:GOTO MENU
5299 REM # PRINT FIELD # AND HEADINGS
5300 POKE N82,N0:? "}":? "FIELD              FIELD NAME"
5310 ? DASH$(N1,N39):TEMP=N5:TEMP1=N2
5320 FOR T=N1 TO RDAT(N16):IF T=N10 THEN TEMP1=N1
5330 ? SPACE$(N1,TEMP1);T;" ";FIELD$(TEMP,TEMP+FDAT(T)-N1)
5340 TEMP=TEMP+FDAT(T)+N5:NEXT T
5350 TRAP 5300:POSITION N3,N21:? "Enter field number to be sorted"
5360 ? "        0 to exit ";:INPUT TEMP:IF TEMP=N0 THEN POP :GOTO MENU
5370 IF TEMP>N0 AND TEMP<=RDAT(N16) THEN RETURN
5380 COUNT=N21:GOSUB SCLEAR:POSITION N12,N22:? B$;"invalid number"
5390 FOR DELAY=N1 TO N200:NEXT DELAY:COUNT=N21:GOSUB SCLEAR:GOTO 5350
5499 REM # SPLIT A FILE INTO TWO PARTS
5500 IF F2<>N1 THEN 220
5530 ? "}":? :? :? " Please ensure that the field, where     you want to select
the point at         which to split the "
5540 ? "file, is sorted.":? :? " Then use the FIND function to decide    the rec
ord number to split from."
5550 ? :? " The record number you choose will be    the starting record number f
or the     second file."
5560 ? :? " Do you have the record # (Y or N)";:GET #N1,KEY
5570 IF KEY=N78 THEN GOTO MENU
5580 IF KEY<>N89 THEN 5530
5590 ? "}":? :? " Please enter record number :-":? :? :MAXLEN=N3:GOSUB KEYINPUT:
IF TEMP$=E$ THEN GOTO MENU
5600 TRAP 5900:TEMP=VAL(TEMP$):POKE 243,128:POKE 244,N5:IF TEMP<N2 OR TEMP>LEN(D
AT$)/RDAT(N17) THEN 5900
5610 TEMP=TEMP-N1:START=(TEMP*RDAT(N17)+N1):? "}":? :? :? " File in use :-";FILE
$:TEMP2=LEN(DAT$)
5620 FOR T=N2 TO N1 STEP -N1
5630 ? :? :? :? " Please enter a DOS file name for part   ";T;" of program":? :?
 " Do not include D1: or .EXT":? :?
5640 MAXLEN=N8:GOSUB KEYINPUT:IF TEMP$=E$ THEN POP :GOTO MENU
5650 FILE$=TEMP$:TEMP4=N1:GOSUB 7060
5660 TEMP2=START-N1:START=N1:? "}":NEXT T
5670 ? "}Both parts of the file have been saved  to disk.":? :? "You can Know go
 to main menu and "
5680 ? " select which file you wish to use.....":? :? "     press (RETURN) when
 ready"
5690 GET #N1,KEY:RUN
5900 POSITION N15,N22:? B$;"INVALID KEY":FOR DELAY=N1 TO N200:NEXT DELAY:GOTO 55
90
5999 REM # CREATE A NEW DATABASE
6000 ? "}      Do you wish to create a new                database    (Y or N) ";:
GET #N1,KEY
6010 IF KEY=N78 THEN GOTO MENU
6020 IF KEY<>N89 THEN 6000
6029 REM # IF LEN(DAT$)>0 THEN FILE ALREADY IN USE
6030 IF LEN(DAT$)=N0 THEN 6080
6040 ? B$;"}Creating a new file will DELETE current file :-":? :? FILE$
6050 ? :? "SAVE current file first (Y or N)";:GET #N1,KEY
6060 IF KEY=N89 THEN GOTO MENU
6070 IF KEY<>N78 THEN 6050
6080 ? :? "} Please enter a DOS file name":? " Do not include D1: or .EXT":? :?
6100 F1=N0:F2=N0:MAXLEN=N8:GOSUB KEYINPUT:IF TEMP$=E$ THEN GOTO MENU
6110 FILE$=TEMP$
6120 FIELD$="####":RLEN=N0:FLEN=N4:PLEN=N0:DAT$="":GOSUB 6980
6130 FOR T=N1 TO N15
6140 POSITION N3,N10:? "Enter a name for field heading #";T;:? :?
6150 MAXLEN=N35:GOSUB KEYINPUT:IF TEMP$=E$ AND T>N1 THEN T=T-N1:POP :GOTO 6300
6160 IF TEMP$=E$ THEN ? "} Database NO7 created":FOR DELAY=N1 TO N200:NEXT DELAY
:POP :GOTO MENU
6170 TEMP1=LEN(TEMP$):IF TEMP1+FLEN+N5>380 THEN 6800
6180 FLEN=FLEN+TEMP1+N5
6190 FIELD$(LEN(FIELD$)+N1)=TEMP$:FIELD$(LEN(FIELD$)+N1)="#####"
6200 POSITION N0,N15:? "   Enter maximum number of characters          required
for above field":? #7
6215 MAXLEN=N3:GOSUB KEYINPUT:IF TEMP$=E$ THEN 6200
6220 FOR T2=N1 TO LEN(TEMP$):IF TEMP$(T2,T2)<"0" OR TEMP$(T2,T2)>"9" THEN POP :G
OTO 6030
6225 NEXT T2:IF TEMP$(N1,N1)="0" THEN 6030
6230 TEMP=RLEN+VAL(TEMP$):TEMP2=VAL(TEMP$):POKE 243,128:POKE 244,N5
6240 IF TEMP=RLEN THEN 6020
6250 IF TEMP>254 THEN 6010
6255 RLEN=TEMP
6260 IF TEMP1<TEMP2 THEN PLEN=PLEN+TEMP2+N1:GOTO 6275
6270 PLEN=PLEN+TEMP1+N1
6275 TEMP1=LEN(TEMP$):TEMP$="000":TEMP$(N4-TEMP1,N3)=STR$(TEMP2)
6280 FIELD$(LEN(FIELD$)-N3,LEN(FIELD$)-N1)=TEMP$
6285 IF RLEN=254 THEN POP :GOTO 6300
6290 GOSUB 6980:GOSUB 6700:NEXT T:T=T-N1
6299 REM # CHECK FIELD NAMES AND RECORD WIDTHS
6300 FIELD$(N2,N3)=STR$(T):TEMP1=N5:TEMP2=N5:T=N1
6310 FOR T=N1 TO VAL(FIELD$(N2,N3)):POKE 243,128:POKE 244,N5
6320 TEMP2=TEMP2+N1:IF FIELD$(TEMP2,TEMP2)<>"#" THEN 6320
6330 ? "}":? :? "       Field heading number ";T:? :? DASH$(N1,N38)
6340 FOR Z=TEMP1 TO TEMP2-N1:? CHR$(ASC(FIELD$(Z,Z))+128);:NEXT Z
6360 ? :? :? "  field length = ";FIELD$(TEMP2+N1,TEMP2+N3):TEMP1=TEMP2+N5:TEMP2=
TEMP1-N1
6370 GOSUB 6300:NEXT T:F1=N1:GOTO 9500
6380 ? DASH$(N1,N38):POSITION 7,N20:? "Is the above information
  correct (Y or N) ";
6390 GET #N1,KEY
6400 IF KEY=N89 THEN RETURN
6410 IF KEY<>N78 THEN 6390
6420 POP :POSITION N6,N22:? B$;"Please re-enter field data":FOR DELAY=N1 TO N200
:NEXT DELAY:GOTO 6120
6700 Y1=PEEK(84)
6710 TEMP$=STR$(RLEN):POSITION N21-LEN(TEMP$),N3:? RLEN
6720 TEMP$=STR$(FLEN):POSITION N21-LEN(TEMP$),N4:? FLEN
6730 TEMP$=STR$(PLEN):POSITION N21-LEN(TEMP$),N5:? PLEN
6740 POKE 84,Y1:RETURN
6800 POSITION N0,N21:? B$;"Heading length too long":POSITION N10,N22:? "Re-enter
 field name"
6805 FOR DELAY=N1 TO N200:NEXT DELAY:COUNT=N10:GOSUB SCLEAR:GOTO 6140
6810 POSITION N6,N21:? "Length of field is too long":GOTO 6030
6820 POSITION N5,N21:? "ZERO field length not allowed"
6830 POSITION N9,N22:? "re-enter field length"
6840 SOUND N0,N150,N10,N10:FOR DELAY=N1 TO N40:NEXT DELAY:SOUND N0,N0,N0,N0
6850 FOR DELAY=N1 TO N200:NEXT DELAY:COUNT=N15:GOSUB SCLEAR:GOTO 6200
6980 ? "}       CREATING A NEW DATABASE"
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6910 ? :? "FILE NAME      : "|FILE$
6920 ? "record  length : 000   max length: 254"
6930 ? "heading length : 000   max length: 300"
6940 ? "printer length : 000   max 40,80,132"
6950 ? :? "Press ESC to finish creating database":? R#:RETURN
6999 REM # SAVE A FILE TO DISK
7000 IF F2<>N1 THEN 220
7020 ? "}      Do you wish to save a file                    to DISK (Y or N)"|
7030 GET #N1,KEY
7040 IF KEY=N78 THEN GOTO MENU
7050 IF KEY<>N89 THEN 7030
7060 ? "}       SAVING A FILE TO DISK"
7070 ? :? " FILE NAME: "|FILE$:? :? R#
7090 ? :? "   Place a data disk into drive  #1"
7100 ? :? "       press (RETURN) when ready"
7110 GET #N1,KEY
7120 TEMP$="D1:":TEMP$(LEN(TEMP$)+N1)=FILE$:TEMP$(LEN(TEMP$)+N1)=".INF":FILE$=TE
MP$
7130 GOSUB 7600:IF TEMP=N2 THEN GOSUB 7500
7140 ? "}":POSITION N1,N10:? R#:? "          SAVING FILE TO DISK          ":? R#:
REM # ALL IN INVERSE
7170 TRAP 7700:OPEN #N2,N8,N0,FILE$:? #N2;FIELD$:CLOSE #N2:XIO 35,#N2,N8,N0,FILE
$
7180 FILE$(LEN(FILE$)-N3,LEN(FILE$))=".DAT":IF TEMP=N2 THEN GOSUB 7560
7190 OPEN #N2,N8,N0,FILE$:IF TEMP4=N0 THEN ? #N2;DAT$:GOTO 7200
7195 ? #N2;DAT$(START,TEMP2)
7200 CLOSE #N2:XIO 35,#N2,N8,N0,FILE$
7210 ? "}":POSITION N1,N10:? B#;R#:? "          SAVING COMPLETED          ":?
R#:REM # ALL IN INVERSE
7240 FOR DELAY=N1 TO N200:NEXT DELAY
7249 REM # IF TEMP4=1 THEN WE CAME FROM SPLIT ROUTINE
7250 FILE$=FILE$(N4,LEN(FILE$)-N4):IF TEMP4=N1 THEN RETURN
7260 GOTO MENU
7499 REM # FILE ALREADY EXISTS, DELETE OLD FILE??
7500 ? :? :? B#;"      FILE ALREADY EXISTS."
7510 ? :? "Do you want to DELETE old file (Y or N)"|
7520 GET #N1,KEY
7530 IF KEY=N89 THEN 7560
7540 IF KEY<>N78 THEN 7520
7550 ? :? :? " Place another DOS disk into drive #1":? :? "      Press (RETURN)
when ready"
7555 GET #N1,KEY:POP :? "}":GOTO 7130
7560 XIO 36,#N2,N8,N0,FILE$:RETURN
7590 REM # CHECK DISK DIRECTORY TO SEE IF FILE ALREADY EXISTS
7599 REM # COULD BE FATAL IF WE DELETE WRONG FILE!!!!
7600 OPEN #N2,N6,N0,"D1:*.*":TRAP 7650
7610 INPUT #N2,TEMP$
7620 IF FILE$(N4,LEN(FILE$)-N4)=TEMP$(N3,N3+(LEN(FILE$)-N0)) THEN CLOSE #N2:TEMP
=N2:RETURN
7630 GOTO 7610
7650 CLOSE #N2:TEMP=N1:RETURN
7700 CLOSE #N2:? :? B#;"    DISK FULL or WRITE PROTECTED":FILE$=FILE$(N4,LEN(FIL
E$)-N4)
7710 ? :? :? "      Press (RETURN) when ready":GET #N1,KEY:GOTO MENU
7999 REM # LOAD A FILE FROM DISK
8000 ? "}      Do you wish to load a file                    from DISC (Y or N)"|
8010 GET #N1,KEY
8020 IF KEY=N78 THEN GOTO MENU
8030 IF KEY<>N89 THEN 8000
8040 IF LEN(DAT$)=N0 THEN 8090
8050 ? B#;"}Loading a new file will DELETE current file :-":? :? FILE$
8060 ? :? "SAVE current file first (Y or N)"|:GET #N1,KEY
8070 IF KEY=N89 THEN GOTO MENU
8080 IF KEY<>N78 THEN 8060
8090 DAT$="":TEMP$="":FILE$="":FIELD$="":DAT$=" ":DAT$(LE)=" ":DAT$(N2)=DAT$:F1=
N0:F2=N0
8100 ? "}       LOADING A FILE FROM DISK"
8110 ? :? :? "Enter name of file to load":? "Do not include D1: or .EXT"|? :?
8115 MAXLEN=N8:GOSUB KEYINPUT:IF TEMP$=E$ THEN DAT$="":GOTO MENU
8120 ? :? :? :? "    Place DOS disk into drive  #1"
8130 ? :? "      Press (RETURN) when ready":GET #N1,KEY
8140 ? "}":POSITION N1,N10:? R#:? "          LOADING FILE          ":? R#:
REM # ALL IN INVERSE
8170 FILE$="D1:":FILE$(LEN(FILE$)+N1)=TEMP$:FILE$(LEN(FILE$)+N1)=".INF"
8180 TRAP 8600:OPEN #N2,N4,N8,FILE$:TRAP 8200
8190 GET #N2,TEMP:IF TEMP=N155 THEN CLOSE #N2:GOTO 8220
8195 FIELD$(LEN(FIELD$)+N1)=CHR$(TEMP):GOTO 8190
8200 CLOSE #N2:IF PEEK(195)<>136 THEN 8600
8220 FILE$(LEN(FILE$)-N3,LEN(FILE$))=".DAT"
8230 TRAP 8600:OPEN #N2,N4,N0,FILE$
8239 REM # CALL MIC FOR QUICK LOAD
8240 POKE 866,7:X=USR(1536,ADR(DAT$),LE+N2)
8250 CLOSE #N2:IF PEEK(200)<>136 THEN 8500
8260 TEMP=X-N1:DAT$(TEMP)=DAT$(TEMP,TEMP)
8270 ? "}":POSITION N1,N10:? B#;R#:? "          FILE HAS BEEN LOADED          ":?
R#:REM # ALL IN INVERSE
8300 FOR DELAY=N1 TO N100:NEXT DELAY:F1=N1:F2=N1:FILE$=FILE$(N4,LEN(FILE$)-N4):G
OTO 9500
8500 ? "}":? :? " Disk data CORRUPTED, cannot load file :-":? :? TEMP$:? :? "Ple
ase check disk":GOTO 8620
8600 CLOSE #N2:? "}       FILE NOT ON THIS DISK "
8610 ? :? "  Please put correct disk in drive #1"
8620 ? :? "       press RETURN when ready":GET #N1,KEY:GOTO 8090
8999 REM # EXIT FROM PROGRAM
9000 ? "}":? :? "To exit from this program will mean     that all data will be l
ost!!"
9010 ? B#:? :? :? "Do you still wish to EXIT from program":? :? " enter (Y or N)
"
9020 GET #N1,KEY
9030 IF KEY=N78 THEN GOTO MENU
9040 IF KEY<>N89 THEN 9020
9050 ? "}":? :? "          PROGRAM  ENDED"
9060 POKE 752,N0:END
9498 REM # SET UP ARRAYS etc AFTER CREATE OR LOAD
9499 REM # CALLED ONLY AFTER A CREATE OR LOAD
9500 ? "} PLEASE WAIT..":TEMP=VAL(FIELD$(N2,N3)):TEMP1=N5:TEMP2=N5:PLEN=N0
9520 RDAT(N16)=N0:RDAT(N17)=N0:FDAT(N16)=N0:FDAT(N17)=N0
9530 FOR T=N1 TO TEMP
9540 TEMP2=TEMP2+N1:IF FIELD$(TEMP2,TEMP2)<>"#" THEN 9540
9550 FDAT(T)=TEMP2-TEMP1:RDAT(T)=VAL(FIELD$(TEMP2+N1,TEMP2+N3))
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9560 FDAT(N17)=FDAT(N17)+FDAT(T):RDAT(N17)=RDAT(N17)+RDAT(T)
9570 TEMP1=TEMP2+N5:TEMP2=TEMP1-N1:NEXT T
9580 FDAT(N16)=TEMP:RDAT(N16)=TEMP:RLEN=RDAT(N17):FLEN=FDAT(N17)
9590 FOR T=N1 TO TEMP:IF FDAT(T)<RDAT(T) THEN PLEN=PLEN+RDAT(T):GOTO 9610
9600 PLEN=PLEN+FDAT(T)
9610 NEXT T:PLEN=PLEN+RDAT(N16):POKE 243,128:POKE 244,N5:GOTO MENU
9799 REM * GET DISK DIRECTORY
9800 ? "}":? :? :? "       Place disk into drive #1,              press <RETURN>
when ready.":GET #N1,KEY
9810 OPEN #N2,N6,N0,"D:*.*":TRAP 9840
9820 ? "}  DISK DIRECTORY":?
9830 INPUT #N2,TEMP$:? TEMP$:GOTO 9830
9840 CLOSE #N2:? :? :? " Press any key to return to main menu";:GET #N1,KEY:GOTO
 MENU
9999 REM * MAIN MENU
10000 POKE 82,N1:GRAPHICS N0:SETCOLOR N2,N10,N6:POKE 752,N1:POKE 16,64:POKE 53
774,64:SETCOLOR N1,202,N15
10010 ? #6:? "           M A I N  M E N U            ":? #6:REM * ALL IN INVERSE
10040 IF F1=N1 THEN ? :? "        File in use :- ";FILE$
10050 ? :? "       <C> CREATE a new database"
10060 ? :? "       <A> ADD records"
10070 ? "       <F> FIND/PRINT/MODIFY records"
10080 ? "       <S> SORT records"
10090 ? :? "       <P> PUT records onto disk"
10100 ? "       <G> GET records from disk"
10110 ? :? "       <D> DISK DIRECTORY"
10120 ? :? "       <T> SPLIT file in two"
10130 ? :? "       <E> EXIT from program"
10140 ? :? #6:? "       PLEASE ENTER YOUR CHOICE"
10150 GET #N1,KEY
10160 IF KEY=65 THEN 1000
10170 IF KEY=67 THEN 6000
10180 IF KEY=68 THEN 9000
10190 IF KEY=69 THEN 9000
10200 IF KEY=70 THEN 2000
10210 IF KEY=71 THEN 8000
10220 IF KEY=80 THEN 7000
10230 IF KEY=83 THEN 5000
10240 IF KEY=84 THEN 5500
10250 GOTO 10000
14999 REM * SET UP VARIABLES, ARRAYS, etc
15000 N0=0:N1=1:N2=N1+N1:N3=N2+N1:N4=N3+N1:N5=N4+N1:N6=N5+N1:N8=N5+N3:N9=N8+N1:N
10=N9+N1:N12=N10+N2
15010 N15=N12+N3:N16=N15+N1:N18=N16+N2:N20=N10+N10:N30=N20+N10:N38=N30+N8:N35=N3
0+N5:N764=764:N17=N16+N1
15020 N40=N30+N10:N60=N40+N40:N200=N100+N20:N83=N80+N3:N70=N80-N10:N82=N80+N2:N10
0=N10*N10:N255=255:N155=155
15030 N39=N30+N1:N89=N80+N9:N500=N5*N100:N150=N15*N10:N132=132:N22=N20+N2:N21=N2
0+N1:N78=N70+N8
15040 MENU=10000:SCLEAR=N200:KEYINPUT=N10:OPEN #N1,N4,N0,"K:":POKE 82,N1
15060 DIM FDAT(N17),RDAT(N17),TEMP$(N255),FIELD$(300),FILE$(N15),DASH$(N255),SPA
CE$(N255)
15070 DIM B$(N1),R$(N30),E$(N1)
15080 DASH$="-":DASH$(N255)="-":DASH$(N2)=DASH$:SPACE$=" ":SPACE$(N255)=" ":SPAC
E$(N2)=SPACE$
15090 B$=CHR$(253):FOR T=N1 TO N30:R$(T,T)=CHR$(N18):NEXT T:E$=CHR$(27)
15100 LE=FRE(X)-N100:DIM DAT$(LE)
15110 IF PEEK(1536)<>N4 THEN ? B$:? :? " You will have to 'RUN D1:DBASEDAT.BAS'
 file first":POKE 752,N1:END
15120 GOTO MENU
16000 REM * HERE IS A LIST OF VARIBLES USED :-
16010 REM * FDAT(N) - width of each field heading name
16020 REM * RDAT(N) - width of each record field
16030 REM * DAT$    - file data
16040 REM * FIELD$  - field names and record widths
16050 REM * FILE$   - DOS file name
16060 REM * TEMP$   - temporary string storage area
16070 REM * DASH$   - 255 dashes
16080 REM * SPACE$  - 255 spaces
16090 REM * B$      - bell
16100 REM * R$      - 30 control R
16110 REM * T,T1,T2 - loop variables
16120 REM * TEMP-TEMP4 - temporary variables
16130 REM * N0-N764 - as number, but saves 6 bytes
16140 REM * when used instead of the actual number
16150 REM * POKE 243,128:POKE 244,5 - clears the bug
16160 REM * which occurs when using GET and VAL
16170 REM * X1,X2,Y1,Z - used for keyboard input routine
16180 REM * START,RSTART - used for pointers in DAT$
16190 REM * MAXLEN  - maximum # characters in input routine
16200 REM * PLEN,RLEN,FLEN - printer,record,field lengths
16210 REM * PRTCOL  - printer column width
16220 REM * PRT     - set to 1 when printer selected
16230 REM * F1      - set to 1 if FIELD$ contains data
16240 REM * F2      - set to 1 if DAT$ contains data
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BBC Graphics Utilities Monitor

by Brian Butterworth

MICROTEX 666

Still keying in programs? Forget it! This program is available for telesoftware downloading on Microtex 666 (page *66614#.)

This program provides a user-friendly method of manipulating disk files, using windows and icons.

To use it, type in the two programs and save them onto disk as directed. Then to run the program, type CHAIN "GUM".

When it is running, move the pointer using the cursor keys and select an option by pressing RETURN. Firstly, select a disk drive by positioning the pointer over the disk symbol showing the drive number you want, and press RETURN. A window will open showing all the files on the disk. If you select one of these, a window giving information about the file will open at the bottom of the screen. Simultaneously, various menu options will appear at the top of the screen, and are outlined below:

DELETE — this will delete the selected

file if you then select YES. If you select NO, the program will exit from the option.

COPY — this copies the selected file from the current drive to another. Select a destination drive to copy to, or the current one to cancel the command.

DUMP — this dumps the contents of a file to a window on the screen in decimal. RETURN will halt the process.

PRINT — prints the text in a file on-screen in a window. RETURN will cancel it.

EXTRA — this produces a pull-down menu containing another set of commands. These are: NEWLOAD, which changes the LOAD address; NEWEXEC, which changes the execution address; CHAIN, which CHAINs the selected file; RUN, which *RUNs it; LOCK and UNLOCK, which lock and unlock the selected file; RENAME, which renames it; and CLEAR, which takes you back to the main menu.

To change disk drive, select the new drive. The calculator symbol brings up a simple calculator which is operated by the keys; press RETURN to get rid of it.

The book symbol changes the selected directory. This is $ normally, but can be changed.

```
 10*|*******  GRAPHICS  UTILITIES  MONITOR *******
 20*|
 30*|
 40*|  Part one:  SAVE as "GUM"
 50*|
 60*|
 70VDU23,224,170,85,170,85,170,85,170,85
 80VDU23,225,0,60,102,102,126,102,102,0
 90VDU23,226,0,124,102,124,102,102,124,0
100VDU23,227,0,60,102,96,96,102,60,0
110VDU23,228,0,124,102,102,102,102,124,0
120VDU23,229,0,126,96,124,96,96,126,0
130VDU23,230,0,126,96,124,96,96,96,0
140VDU23,231,0,60,102,96,110,102,60,0
150VDU23,232,0,102,102,126,102,102,102,0
160VDU23,233,0,126,24,24,24,24,126,0
170VDU23,234,0,126,12,12,108,108,56,0
180VDU23,235,0,102,102,124,102,102,102,0
190VDU23,236,0,96,96,96,96,96,126,0
200VDU23,237,0,102,126,126,126,102,102,0
210VDU23,238,0,102,118,126,126,110,102,0
220VDU23,239,0,60,102,102,102,102,60,0
230VDU23,240,0,124,102,102,124,96,96,0
240VDU23,241,0,60,102,102,102,106,52,0
250VDU23,242,0,124,102,102,124,108,102,0
260VDU23,243,0,62,96,124,62,6,124,0
270VDU23,244,0,126,24,24,24,24,24,0
280VDU23,245,0,102,102,102,102,102,60,0
290VDU23,246,0,102,102,102,102,60,24,0
300VDU23,247,0,102,102,126,126,126,102,0
310VDU23,248,0,102,60,24,24,60,102,0
320VDU23,249,0,102,102,60,24,24,24,0
330VDU23,250,0,126,14,28,56,112,126,0
340VDU23,251,0,60,102,6,28,24,24,0
350:
360:
370:
380DATA&5060,7F405F505F405B5B405B5B405B5B407FF808E828E808686808686808686808FB
390DATA&50C0,FF40C043D053C040C050D040C040FF55FE0302BB027B02030203020302030FE55
400DATA&5220,00FEB2FFB0BF80BF80BFB0B080B0FF00000000FF01C101C101C101C101010101FF00
410DATA&5260,00003F2020202021202121212030000000FC0404040404B404B4B4B404FC0000
420DATA&5600,00406070787C7E7F7B6C4C06060303000000000000000000000000000000000000
430DATA&5620,C0E0F0F8FCFEFFFFFFFEFE4F0F0707030000000000000B0B0000000000B0B000
440:
450:
460:
470MODE4
480HIMEM=&5000
490FORR%=0TO5
500READA%,A$
510FORD%=0TO31
520A%?D%=EVAL("&"+MID$(A$,1+D%*2,2))
530NEXT
540NEXT
550:
560:
570:
580CHAIN"GUM2"



 10 *|*******  GRAPHICS  UTILITIES  MONITOR *******
 20 *|
 30 *|
 40 *|  Part two:  SAVE as "GUM2"
 50 *|
 60 *|
 70 *FX200,1
 80 *TV0,1
 90 MODE4:VDU23;&200A;0;0;0;0;0;
100 PROCwindow(6,16,33,14)
110 PRINT
120 PROCtext(" GRAPHICS UTILITIES MONITOR")
130 *DR.0
140 *DIR$
150 TIME=0:REPEATUNTILTIME>200
160 @%=10
170 HIMEM=&5000
180 DIMD$(32),BUFF%&200.ST%=0:DR%=-1
190 CF%=0
200 :
210 :
220 :
230 PROCinitcode
240 PROCscreen
250 PROCsetpo(48,49)
260 ONERRORPROCwindow(8,22,37,20):REPORT:REPEATUNTILINKEY-74:PROCreadcat(DR%):
PROCcatdisp
270 REPEATPROCmove
```

```
  PROCselect
  PROCnewdir
  UNTILDRX%>-1
REPEAT
  PROCselfile
  UNTILO
:
:
:
END
:
:
:
DEFPROCdesk
VDU26,20
VDU23;&200A;0;0;0;0;
CLS
VDU19,7,0;0;
VDU23,128,&55AA;&55AA;&55AA;&55AA;
FORRX=0TO30
  PRINTSTRING$(40,CHR$128);
  NEXT
VDU5
MOVE0,31
PRINTSTRING$(40,CHR$128);
VDU4
VDU19,0,7;0;
ENDPROC
:
:
:
DEFPROCwindow(LX%,BY%,RX%,TY%)
GCOL0,129
FORRX=-4TOOSTEP4
  VDU29,-RX;RX;
  VDU24,LX%*32-4;1023-(BY%+1)*32;RX%*32+32;1023-(TY%)*32+4;:CLG
  VDU28,LX%,BY%,RX%,TY%
  NEXT:CLS
GCOL0,128
ENDPROC
:
:
:
DEFPROCicon(N%,X%,Y%)
LOCALO%
N%=N%*32+&5000
FORO%=252TO255
  VDU23,O%
  FORD%=0TO7
    VDU?N%:N%=N%+1
    NEXT
  NEXT
VDU31,X%,Y%,252,254,8,8,10,253,255
ENDPROC
:
:
:
DEFPROCinverse(X%,Y%,X2%,Y2%)
VDU24,0;0;1279;1023;
LOCALA%,B%,C%,D%
A%=32*X%-4:C%=32*(X2%+X%)
B%=1024-32*Y%
D%=1024-32*(Y%+Y2%)-4
GCOL4,3
MOVEA%,B%:MOVEC%,B%
PLOT85,A%,D%:PLOT85,C%,D%
MOVEC%,B%:MOVEA%,D%
PLOT85,C%,B%
ENDPROC
:
:
:
DEFPROCinitcode
DIMU%1024,SX32,EX32,FX32
FORPASS=0TO2STEP2
  P%=U%
  [OPTPASS
  LDA&71:ASLA:ASLA:CLC:ADC&71
  STA&72:LDA#0:STA&73
  ASL&72:ROL&73
  ASL&72:ROL&73
  ASL&72:ROL&73
  LDA&72:CLC:ADC&70:STA&72
  LDA&73:ADC#0:STA&73
  ASL&72:ROL&73
  ASL&72:ROL&73
  ASL&72:ROL&73
  LDA&73:CLC:ADC#&58
  STA&73
  LDA&72:CLC:ADC#320 MODZ56
  STA&74
  LDA&73:ADC#320 DIVZ56
  STA&75
  LDY#15:.loop1
  LDA(&72),Y:STASX,Y
  LDA(&74),Y:STASX+16,Y
  DEY:BPLloop1
  :
  :
  :
  LDY#15:.loop2
  LDASX,Y:ANDEX,Y:ORAFX,Y:STA(&72),Y
  LDASX+16,Y:ANDEX+16,Y:ORAFX+16,Y:STA(&74),Y
  DEY:BPLloop2
  RTS
  :
  .blank
  LDY#15:.loop3
  LDASX,Y:STA(&72),Y
  LDASX+16,Y:STA(&74),Y
```

```
1380   DEY:BPLloop3
1390   RTS
1400   ]NEXT
1410 OLWE%=-1:F1%=F%:E1%=E%
1420 !&70=&404
1430 ENDPROC
1440 :
1450 :
1460 :
1470 DEFPROCsetpo(M%,I%)
1480 F%=F1%:E%=E1%
1490 FORR%=0TO31:E%?R%=-1EOR?(R%+&5000+32*I%):F%?R%=?(R%+&5000+32*M%)
1500   NEXT
1510 FORR%=0TO7STEP4:Q%=!(R%+E%+8):!(R%+E%+8)=!(R%+E%+16):!(R%+E%+16)=Q%
1520   Q%=!(R%+F%+8):!(R%+F%+8)=!(R%+F%+16):!(R%+F%+16)=Q%
1530   NEXT
1540 ENDPROC
1550 :
1560 :
1570 :
1580 DEFPROCmove
1590 LOCALT%
1600 CALLU%
1610 REPEAT
1620   T%=?&70
1630   Y%=?&71
1640   IFINKEY(-26):T%=T%-1
1650   IFINKEY(-122):T%=T%+1
1660   IFINKEY(-42):Y%=Y%+1
1670   IFINKEY(-58):Y%=Y%-1
1680   IFINKEY(-1):TIME=0:REPEATUNTILTIME>2
1690   IFT%<0:T%=0
1700   IFT%>39:T%=39
1710   IFY%>31:Y%=31
1720   IFY%<0:Y%=0
1730   IF(T%<>?&70)OR(Y%<>?&71)THENCALLblank:?&70=T%:?&71=Y%:CALLU%
1740   UNTILINKEY-74
1750 X%=?&70
1760 Y%=?&71
1770 CALLblank
1780 *FX4,2
1790 ENDPROC
1800 :
1810 :
1820 :
1830 DEFPROCtext(A$)
1840 LOCALY%,D%
1850 FORY%=1TOLENA$
1860   D%=ASCMID$(A$,Y%,1)
1870   IFD%<64VDUD%:ELSEVDU128+(D%AND&1F)
1880   NEXT
1890 ENDPROC
1900 :
1910 :
1920 :
1930 DEFPROCscreen
1940 PROCdesk
1950 PROCicon(6,2,25)
1960 PROCwindow(1,1,38,1)
1970 PROCwindow(1,22,4,3)
1980 PROCicon(3,1,17)
1990 LOCALR%
2000 FORR%=0TO3
2010   PROCicon(19,1,R%*4+1)
2020   VDU5:MOVE80,832-R%*128:PRINT;R%;:VDU4
2030   NEXT
2040 PROCwindow(20,16,35,14)
2050 PRINT:PROCtext("  SELECT DRIVE")
2060 ENDPROC
2070 :
2080 :
2090 :
2100 DEFPROCselect
2110 IF(X%>0)AND(X%<5)AND(Y%<19)AND(Y%>3):ELSEENDPROC
2120 IFDR%<>-1:PROCinverse(2,DR%*4+4,2,3)
2130 DR%=(Y%-4)DIV4
2140 SE%=0
2150 PROCinverse(2,DR%*4+4,2,3)
2160 PROCreadcat(DR%)
2170 PROCcatdisp
2180 ENDPROC
2190 :
2200 :
2210 :
2220 DEFPROCreadcat(DRIVE%)
2230 IFDRIVE%<0THENENDPROC
2240 LOCALD$,E$,R%
2250 FORR%=0TO31:D$(R%)="":NEXT
2260 VDU3
2270 PROCosCli("DRIVE "+STR$DRIVE%)
2280 *FX15
2290 LOCALA%,X%,Y%
2300 A%=8:X%=BUFF%MOD256:Y%=BUFF%DIV256
2310 BUFF%!1=BUFF%+&100:BUFF%!5=31
2320 BUFF%!9=0
2330 CALL&FFD1
2340 A%=BUFF%+&100
2350 IFBUFF%?5=31THENnofile%=0:ENDPROC
2360 FORnofile%=1TO31-BUFF%?5
2370   D$=FNread(A%+1,?A%-1):A%=A%+1+?A%
2380   REPEATIFRIGHT$(D$,1)=" "THENE$=LEFT$(D$,LEND$-1):D$=E$
2390     UNTILRIGHT$(D$,1)<>" "
2400   D$(nofile%)=D$
2410   NEXT
2420 nofile%=31-BUFF%?5
2430 CF%=0:ST%=0
2440 VDU26:PRINTTAB(0,27);STRING$(160,CHR$128);
2450 VDU26,10,9:PRINTSPC(34);:PROCtext("QUIT")
2460 ENDPROC
2470 :
2480 :
```

```
2490 :
2500 DEFFNread(ADDX,NOX)
2510 LOCALA$,BX
2520 FORBX=ADDXTOADDX+NOX
2530   A$=A$+CHR$(?BX)
2540   NEXT
2550 =A$
2560 :
2570 :
2580 :
2590 DEFPROCcatdisp
2600 IFDRX<0:ENDPROC
2610 VDU26:LOCALRX:FORRX=3TO9:PRINTTAB(18,RX);STRING$(13,CHR$128);:NEXT
2620 PROCwindow(7,26,38,10)
2630 IFnofileX=0:ENDPROC
2640 FORGX=STX*16TO(STX*16)+15
2650   XX=(GXAND3)*8:YX=((GXAND15)DIV4)*4+1
2660   IFD$(GX+1)<>"":PROCicon(17,XX+3,YX):VDU5,25,4,32*(XX+11)-16*LEND$(GX+1
1023-32*(YX+12);:PRINTD$(GX+1):VDU4
2670   NEXT
2680 IFnofileX>16:PROCwindow(19,8,27,6):PRINT:PROCtext(" OTHERS")
2690 ENDPROC
2700 :
2710 :
2720 :
2730 DEFPROCselfile
2740 PROCmove
2750 IF(XX>0)AND(XX<5)AND(YX<23)AND(YX>19)PROCinverse(2,20,2,2):PROCcalc:PROCin
verse(2,20,2,2):ENDPROC
2760 IF(XX>18)AND(XX<29)AND(YX<10)AND(YX>5)ANDnofileX>16:PROCinverse(19,6,9,3):
STX=STXEOR1:PROCcatdisp:ENDPROC
2770 IF(XX>6)AND(XX<40)AND(YX<27)AND(YX>9)THENPROCopenfile((XX-7)DIV8,(YX-10)DI
V4):ENDPROC
2780 PROCselect
2790 PROCnewdir
2800 PROCruler(XX)
2810 ENDPROC
2820 :
2830 :
2840 :
2850 DEFPROCcalc
2860 *FX15
2870 LOCALRX,PX,A$
2880 PROCwindow(10,24,21,11)
2890 PROCwindow(11,14,20,14)
2900 VDU26,28,10,24,23,11,30,10:PROCtext(" calculator")
2910 A$="789/456*123-0.=+"
2920 FORPX=0TO3:FORRX=0TO3
2930     PROCicon(44,RX*2+2,PX*2+3)
2940     VDU5:MOVE64*RX+400,495-64*PX:PRINTMID$(A$,RX+PX*4+1,1);:VDU4
2950     NEXT:NEXT
2960 PROCinp
2970 PROCcatdisp
2980 ENDPROC
2990 :
3000 :
3010 :
3020 DEFPROCopenfile(XX,YX)
3030 LOCALNX,HX:HX=TRUE
3040 NX=YX*4+XX+1+16*STX
3050 IFNX>nofileX:ENDPROC
3060 CFX=NX
3070 PROCinverse(XX*8+7,YX*4+11,8,3)
3080 DEFPROCupdate:LOCALHX:HX=FALSE:NX=CFX:IFNX<1THENENDPROC
3090 PROCwindow(1,29,38,28)
3100 PROCicon(17,1,0)
3110 VDU11
3120 PROCtext(" FILENAME   LOAD      EXEC    LOCK")
3130 PRINTTAB(4,1);D$(NX);
3140 PROCfileinfo:PRINTTAB(13,1);FNp(loadX);TAB(23,1);FNp(execX);TAB(34,1);CHR$
(78-11*lockX);
3150 IFHXPROCinverse(XX*8+7,YX*4+11,8,3)
3160 VDU26,10,9:PROCtext("DELETE  COPY  DUMP  EXTRA  PRINT  QUIT")
3170 ENDPROC
3180 :
3190 :
3200 :
3210 DEFPROCnewdir
3220 IF(XX>1)AND(XX<5)AND(YX>24)AND(YX<27):ELSEENDPROC
3230 PROCwindow(8,14,30,12)
3240 PRINT:PROCtext(" SELECT DIRECTORY:")
3250 *FX15,1
3260 E$=GET$
3270 OSCLI"DIR "+E$
3280 PRINTE$;
3290 PROCreadcat(DRX):PROCcatdisp
3300 ENDPROC
3310 :
3320 :
3330 :
3340 DEFPROCfileinfo
3350 LOCALXX,YX,AX
3360 !BUFFX=BUFFX+256
3370 $(BUFFX+256)=D$(NX)
3380 AX=5:XX=BUFFXMOD256:YX=BUFFXDIV256
3390 CALL&FFDD
3400 loadX=BUFFX!2
3410 execX=BUFFX!6
3420 lengthX=BUFFX!&A
3430 lockX=(BUFFX?&E)<>0
3440 ENDPROC
3450 :
3460 :
3470 :
3480 DEFFNp(AX)
3490 =RIGHT$("00000000"+STR$~AX,8)
3500 :
3510 :
3520 :
3530 DEFPROCruler(AX)
3540 IFYX>2THENENDPROC
```

```
3550 LOCALACN%
3560 IFFNlimit(1,7):ACN%=1
3570 IFFNlimit(8,13):ACN%=2
3580 IFFNlimit(14,19):ACN%=3
3590 IFFNlimit(20,26):ACN%=4
3600 IFFNlimit(27,33):ACN%=5
3610 IFFNlimit(34,40):ACN%=6
3620 IFACN%=0THENENDPROC
3630 IFACN%<>6ANDCF%=0THENENDPROC
3640 PROCinverse(st%,1,ln%,1)
3650 IFACN%=1THENPROCdelete
3660 IFACN%=2THENPROCcopy
3670 IFACN%=3THENPROCdump
3680 IFACN%=4THENPROCextras
3690 IFACN%=5THENPROClist
3700 IFACN%=6THENPROCquit
3710 PROCinverse(st%,1,ln%,1)
3720 PROCupdate
3730 IFCF%<1THENPROCwindow(1,1,38,1):VDU26,10,9:PRINTSPC(34);:PROCtext("QUIT")
3740 PROCcatdisp
3750 ENDPROC
3760 :
3770 :
3780 :
3790 DEFFNlimit(S%,T%)
3800 IFACN%<1THENst%=S%:ln%=T%-S%+1
3810 IF(A%>=S%)AND(A%<=T%):=-1
3820 =0
3830 :
3840 :
3850 :
3860 DEFPROCdelete
3870 LOCALyes%
3880 PROCwindow(20,20,36,15)
3890 PRINT
3900 PROCtext(" DELETE "+STR$length%)
3910 PRINT:PROCtext(" BYTE FILE")
3920 PRINT':PROCtext(" YES   NO")
3930 REPEAT
3940   PROCmove
3950   UNTIL(Y%>17)AND(Y%<20)AND(X%>20)AND(X%<31)
3960 IF(X%<26)THENyes%=TRUE
3970 IFyes%PROCinverse(21,19,3,1)
3980 IFyes%PROCoscli("ACCESS "+D$(CF%))
3990 IFyes%PROCoscli("DELETE "+D$(CF%))
4000 IFyes%PROCreadcat(DR%)
4010 ENDPROC
4020 :
4030 :
4040 :
4050 DEFPROCoscli(A$)
4060 LOCALX%,Y%
4070 $BUFF%=A$:X%=BUFF%MOD256:Y%=BUFF%DIV256
4080 CALL&FFF7
4090 ENDPROC
4100 :
4110 :
4120 :
4130 DEFPROCquit
4140 PROCwindow(10,16,37,16)
4150 PROCtext("QUIT - ARE YOU SURE  (Y/N)")
4160 REPEAT
4170   *FX15
4180   A$=GET$
4190   UNTILINSTR("YN",A$)
4200 IFA$="Y":VDU22,7:END
4210 ENDPROC
4220 :
4230 :
4240 :
4250 DEFPROClist
4260 CLOSE#0
4270 PROCwindow(7,26,38,10)
4280 LOCALF%,G%,Z%:B%=1
4290 F%=OPENIN(D$(CF%))
4300 @%=4:PRINT0;" ";
4310 REPEAT
4320   Z%=BGET#F%
4330   IFZ%=13THENPRINT'G%" ";:G%=G%+1
4340   IFZ%<31THENZ%=0
4350   VDUZ%
4360   UNTILEOF#F%ORINKEY(-74)
4370 CLOSE#0:PRINT':PROCtext(" PRESS RETURN")
4380 *FX15
4390 REPEATUNTILGET=13
4400 ENDPROC
4410 :
4420 :
4430 :
4440 DEFPROCdump
4450 CLOSE#0
4460 PROCwindow(7,26,38,10)
4470 LOCALF%,G%,Z%:
4480 F%=OPENIN(D$(CF%))
4490 REPEAT
4500   IF(PTR#F%MOD5)=0THEN@%=5:PRINT'PTR#F%;":";
4510   @%=4:PRINTBGET#F%;
4520   UNTILEOF#F%ORINKEY(-74)
4530 CLOSE#0:PRINT':PROCtext(" PRESS RETURN")
4540 *FX15
4550 REPEATUNTILGET=13
4560 ENDPROC
4570 :
4580 :
4590 :
4600 DEFPROCcopy
4610 PROCwindow(10,18,37,16):PRINT:PROCtext(" select drive")
4620 REPEAT
4630   PROCmove
4640   UNTIL(X%>0)AND(X%<5)AND(Y%<19)AND(Y%>3)
4650 NDX=(Y%-4)DIV4
4660 IFNDX=DR%:ENDPROC
```

```
4670 PROCwindow(10,22,37,16)
4680 PRINT":PROCtext(" copying from drive "+STR$DR%+" to"):PRINT':PROCtext(" dr
ive "+STR$ND%)
4690 FORDX=0TO11
4700   PROCinverse(2,ND%*4+4,2,3)
4710   TIME=0:REPEATUNTILTIME>10
4720   NEXT
4730 X%=OPENIN(D$(CF%))
4740 DX=OPENOUT(":"+STR$ND%+"."+D$(CF%))
4750 REPEAT
4760   BPUT#DX,BGET#X%
4770   UNTILEOF#X%
4780 CLOSE#0:PROCcorrect(":"+STR$ND%+"."+D$(CF%),load%,exec%,lock%)
4790 ENDPROC
4800 :
4810 :
4820 :
4830 DEFPROCcorrect(A$,load%,exec%,lock%)
4840 LOCALXX,YX,AX
4850 $(BUFF%+256)=A$
4860 !BUFF%=(BUFF%+256)
4870 BUFF%!2=load%
4880 BUFF%!6=exec%
4890 BUFF%!ME=lock%
4900 AX=1:XX=BUFF%MOD256:YX=BUFF%DIV256:CALL&FFDD
4910 ENDPROC
4920 :
4930 :
4940 :
4950 DEFPROCextras
4960 PROCwindow(20,20,29,4)
4970 RESTORE5130
4980 FORR%=0TO7:READA$:PRINTTAB(1,R%*2+1);:PROCtext(A$):NEXT
4990 REPEAT
5000   PROCmove
5010   UNTIL(X%>20)AND(X%<29)AND(Y%>3)AND(Y%<20)
5020 NR%=(Y%-4)DIV2:PROCinverse(21,NR%*2+5,8,1)
5030 IFNR%=7THENENDPROC
5040 TIME=0:REPEATUNTILTIME>100
5050 IFNR%=0:PROCoscli("ACCESS "+D$(CF%)+" L")
5060 IFNR%=1:PROCoscli("ACCESS "+D$(CF%))
5070 IFNR%=2:load%=FNinput("enter new load address"):PROCcorrect(D$(CF%),load%,
exec%,lock%)
5080 IFNR%=3:exec%=FNinput("enter new exec address"):PROCcorrect'D$(CF%),!load%,
exec%,lock%)
5090 IFNR%=4:VDU22,7:CHAIND$(CF%)
5100 IFNR%=5:VDU22,7:PROCoscli("RUN "+D$(CF%))
5110 IFNR%=6:PROCrename
5120 ENDPROC
5130 DATALOCK,UNLOCK,NEW LOAD,NEW EXEC,CHAIN,RUN,RENAME,CLEAR
5140 :
5150 :
5160 :
5170 DEFFNinput(A$)
5180 PROCwindow(10,25,35,20)
5190 *FX15
5200 LOCALT$,K$
5210 PRINT:PROCtext(" "+A$)
5220 REPEAT
5230   REPEAT
5240     K$=GET$
5250     UNTILINSTR("0123456789ABCDEF"+CHR$13+CHR$127,K$)
5260   IFINSTR("0123456789ABCDEF",K$)ANDLENT$<8THENT$=T$+K$
5270   IFK$=CHR$127:T$=LEFT$(T$,LEN(T$)-1)
5280   PRINTTAB(2,3);:PROCtext(T$+" ")
5290   UNTILK$=CHR$13
5300 =EVAL("&"+T$)
5310 :
5320 :
5330 :
5340 DEFPROCinp
5350 *FX15
5360 LOCALI$,S$,total,L$:L$="+"
5370 VDU28,11,15,24,14
5380 REPEATVDU30
5390   IF(LENSTR$total)>10ANDI$=""ANDINSTR(STR$total,".")>9:I$="E"
5400   @%=&A0A:IFtotal<.1ANDtotal<>0THEN@%=&2080A
5410   IFI$="":PRINTtotal;:ELSEPRINTRIGHT$("          "+I$,10);
5420   REPEAT
5430     S$=GET$:IFI$="E"ANDS$<>"C"THENS$="?"
5440     UNTILINSTR("+-/*=C0123456789."+CHR$127+CHR$13,S$)
5450   IFINSTR("+-*/=",S$)ANDLENI$>0ANDL$<>"":total=EVAL(STR$total+L$+I$):I$=""
:L$=S$:IFL$="=":L$=""
5460   IFINSTR("+-*/",S$)ANDLENI$>0ANDL$="":total=VAL(I$):I$="":L$=S$:IFL$="=":
L$=""
5470   IFINSTR("0123456789.",S$)ANDLENI$<10:I$=I$+S$
5480   IFS$=CHR$127ANDLENI$>0:I$=LEFT$(I$,LENI$-1)
5490   IFS$="C"THENtotal=0:I$="":L$=""
5500   UNTILS$=CHR$13
5510 ENDPROC
5520 :
5530 :
5540 :
5550 DEFPROCrename
5560 LOCALI$,R$,DX
5570 *FX15
5580 PROCwindow(10,20,35,17)
5590 PRINT
5600 PROCtext(" enter new name")
5610 I$=""
5620 REPEATPRINTTAB(1,3);:PROCtext("""+I$+""" ")
5630   R$=GET$
5640   IFR$=CHR$127:I$=LEFT$(I$,LENI$-1):R$=""
5650   IFR$>" "ANDLENI$<7:I$=I$+R$
5660   UNTILLENI$>0ANDR$=CHR$13
5670 FORDX=1TOnofile%:IFD$(DX)=I$:I$=""
5680   NEXT
5690 IFI$="":ENDPROC
5700 PROCoscli("RENAME "+D$(CF%)+" "+I$)
5710 PROCreadcat(DR%)
5720 ENDPROC
```

Memotech MTX Database

by Dave England

The program is a menu-driven database for the Memotech MTX-512 which can handle up to 170 records. For machines with less memory, some juggling with the maximum file dimensions should enable the program to run. Owners of the RS-128 or disk drives should find no problem in extending the program to run with more records and use disk storage. After the Basic listing is Noddy code, which has to be typed in to give the necessary instructions and menus contained within the program.

```
0 REM ******* MTX DATABASE BY DAVE ENGLAND *******
5 REM *******            MAY 1985          ********
10 VS 7: PAPER 12: INK 15: VS 0: PAPER 12: INK 15: VS 1: INK 15: PAPER 12: VS 5:
 PAPER 12: INK 15
20 GOSUB 500
30 GOSUB 200
40 PLOD "INT": GOSUB 400
50 PLOD "PR1": GOSUB 100
60 LET A=(ABS(A-128))
70 ON A GOTO 1000,2000,3000,4000,5000,6000,7000,8000,9010
80 GOTO 50
100 LET A$=INKEY$: IF A$<>"" THEN  GOTO 100
110 LET A$=INKEY$: IF A$="" THEN  GOTO 110
120 LET A=ASC(A$): IF A>90 AND A<127 THEN  LET A=A+32: LET A$=CHR$(A)
130 RETURN
200 REM SET UP PASSWORD
210 VS 5: CLS : PRINT "ENTRY CODE :";: LET B$="": FOR I=1 TO 6: GOSUB 100: LET B
$=B$+A$: PRINT A$;: NEXT I: IF B$<>ENTRY$ THEN  GOTO 210
220 REM change screen colours
230 CLS : PRINT : PRINT "Would you like different screen colours (Y or N)": GOSU
B 100
240 IF A$="N" THEN  RETURN
250 IF A$<>"Y" THEN  GOTO 230 ELSE  PRINT : PRINT : INPUT "New paper colour (1 T
O 15) ";P: IF P>15 THEN  GOTO 250
260 PRINT : PRINT : INPUT "New ink colour (1 TO 15) ";I: IF I>15 THEN  GOTO 260
270 VS 0: PAPER P: INK I: VS 1: PAPER P: INK I: VS 7: PAPER P: INK I: VS 5: PAPE
R P: INK I
280 PRINT : PRINT "Are these colours OK ? (Y or N)": GOSUB 100
290 IF A$="Y" THEN  RETURN  ELSE  IF A$<>"N" THEN  GOTO 280
300 GOTO 230
400 VS 7: CLS : PRINT "Press any key to continue.....";: VS 5: GOSUB 100: RETUR
N
500 LET E=20: LET NR=0: LET NNR=0: LET FILE$="": LET B$="": DIM A$(1),P(15),I(15
),PASS$(6),ENTRY$(6): LET ENTRY$="LOGON1"
510 RETURN
600 CLS : PRINT "Record does not exist in memory": GOSUB 400: RETURN
1000 REM new file routine
1010 PLOD "PR7": GOSUB 100
1020 LET A=ABS(A-128): ON A GOTO 1030,50: GOTO 1000
1030 CLEAR : GOSUB 500: CLS
1040 INPUT "New file name (Maximum 12 letters )     ";B$: IF LEN (B$)>12 THEN  GO
TO 1040 ELSE  LET FILE$=B$
1050 PRINT : PRINT "Number of records to store ": PRINT "Maximum 150 ";: INPUT N
R: IF (NR+E)>170 OR NR<1) THEN  GOTO 1050
1060 PRINT : PRINT "Number of headings per record": PRINT "(Maximum 8) ";: INPUT
 NH: IF NH>8 OR NH<1 THEN  GOTO 1060
1070 DIM HEAD$(NH,20),RECORD$(NR+E,NH,40)
1080 CLS : FOR I=1 TO NH
1090 LET B$="": PRINT : PRINT "Enter heading";I: INPUT B$: IF LEN (B$)>20 THEN
PRINT "Too long": GOSUB 400: GOTO 1090
1100 LET HEAD$(I)=B$: NEXT I
1110 CLS : FOR I=1 TO NR: CSR 11,0: PRINT FILE$;" Page";I: FOR J=1 TO NH
1120 LET B$="": PRINT HEAD$(J): PRINT : INPUT B$
1130 IF LEN (B$)>40 THEN  PRINT "Too long - try again": GOSUB 400: GOTO 1120 ELS
E  LET RECORD$(I,J)=B$
1140 NEXT J: CLS : NEXT I
1150 CLS : PRINT "File now complete as defined": GOSUB 400: GOTO 50
2000 REM save file routine
2010 IF NR=0 THEN  GOSUB 600: GOTO 50 ELSE  PLOD "PR2"
2020 GOSUB 100: LET A=ABS(A-128): ON A GOTO 2030,50: GOTO 2000
2030 VS 7: CLS : PRINT "Start tape then press any key...";: GOSUB 100
2040 VS 7: CLS : PRINT "Saving.....";
2050 SAVE FILE$: GOTO 30
3000 REM examine file routine
3010 IF NR=0 THEN  GOSUB 600: GOTO 50
3020 PLOD "PR3": GOSUB 100
3030 LET A=ABS(A-128): ON A GOTO 3040,3100,50: GOTO 3020
3040 REM examine individual record
3050 CLS : INPUT "Enter the number of the record you wish to see ";R: IF R>NR TH
EN  GOSUB 600: GOTO 3000
3060 CLS : FOR I=1 TO NH: PRINT RECORD$(R,I): PRINT : NEXT
3070 PRINT : PRINT "Is this the correct entry (Y or N) ": GOSUB 100
3080 IF A$="N" THEN  GOTO 3100 ELSE  IF A$<>"Y" THEN  GOTO 3070
3090 GOSUB 400: GOTO 3000
3100 CLS : PRINT "List of records in file (By first      record)"
3110 PRINT : FOR I=1 TO NR: PRINT I;" ";RECORD$(I,1): IF I/10=INT(I/10) THEN  GO
SUB 400
3120 PRINT : NEXT I
3130 GOSUB 400: GOTO 3000
4000 REM load file routine
4010 PLOD "PR4": GOSUB 100: LET A=ABS(A-128): ON A GOTO 4020,50: GOTO 4010
4020 CLS : INPUT "Load which file ? ";FILE$: IF FILE$="" THEN  GOTO 4020
4030 CLS : PRINT "Searching for ";FILE$
4040 LOAD FILE$
5000 REM edit file routine
5010 IF NR=0 THEN  GOSUB 600: GOTO 50
5020 PLOD "PR5": GOSUB 100
5030 LET A=ABS(A-128): ON A GOTO 5040,5110,5140,5190,50: GOTO 5000
5040 REM change record
5050 INPUT "What is the number of the file to      alter ? ";F: IF F>NR THEN  GO
SUB 600: GOTO 5000
5060 FOR I=1 TO NH: PRINT RECORD$(F,I): PRINT : NEXT I
5070 PRINT : PRINT "Is this the correct record (Y or N)": GOSUB 100: IF A$="N" T
HEN  GOTO 5110
```

```
5080 IF A$<>"Y" THEN  GOTO 5070 ELSE  PRINT "Enter the line number  you wish to
     alter or 0 to alter all records ";: INPUT L: IF L=0 THEN  GOTO 5100
5090 PRINT HEAD$(L): PRINT RECORD$(F,L): INPUT "New record:";RECORD$(F,L): GOTO
5000
5100 FOR I=1 TO NH: PRINT HEAD$(I): PRINT RECORD$(F,I): INPUT "New record :";REC
ORD$(F,I): NEXT : GOTO 5000
5110 CLS : PRINT FILE$: PRINT : FOR I=1 TO NR+NNR: PRINT I;" ";RECORD$(I,1): PRI
NT : IF I/10=INT(I/10) THEN  GOSUB 400
5120 NEXT I: GOSUB 400: GOTO 5000
5130 REM change file name
5140 CLS : PRINT "Current file name is ";FILE$
5150 PRINT : PRINT "Do you wish to change this ?(Y or N)"
5160 GOSUB 100: IF A$="Y" THEN  GOTO 5180 ELSE  IF A$<>"N" THEN  GOTO 5160
5170 GOTO 5000
5180 INPUT "New file name (Maximum 12 letters)      ";B$: IF LEN (B$)>12 THEN  GO
TO 5180 ELSE  LET FILE$=B$: GOTO 5000
5190 CLS : FOR I=1 TO NH: PRINT I;" ";HEAD$(I): PRINT : NEXT I
5200 INPUT "Please enter the line number you wish to change ";B$: LET B=VAL(B$):
 IF B>NH OR B<1 THEN  GOTO 5200
5210 PRINT "Please enter new heading": INPUT B$: IF LEN (B$)>20 THEN  PRINT "Too
 long - maximum 20 characters": GOTO 5210
5220 LET HEAD$(B)=B$: GOTO 5000
6000 REM printer routines
6010 IF NR=0 THEN  GOSUB 600: GOTO 50
6020 PLOD "PR6": GOSUB 100
6030 LET A=ABS(A-128): ON A GOTO 6040,6060,6070,6110,6130,50: GOTO 6030
6040 LPRINT CHR$(27);"Q";CHR$(39);
6050 GOTO 6000
6060 LPRINT CHR$(27);"E";: GOTO 6000
6070 FOR I=1 TO NR+NNR: LPRINT FILE$;" Page";I: FOR J=1 TO NH
6080 LPRINT RECORD$(I,J): NEXT J
6090 FOR K=1 TO 5: LPRINT : NEXT K: NEXT I
6100 GOTO 6000
6110 LPRINT "Format of each record": LPRINT : FOR I=1 TO NH: LPRINT HEAD$(I): NE
XT
6120 GOTO 6000
6130 CLS : INPUT "Print which record number ";RN: IF RN>NR THEN  GOSUB 600: GOTO
 6000
6140 CLS : FOR I=1 TO NH: PRINT RECORD$(RN,I): PRINT : NEXT : PRINT "Is this the
 correct record (Y or N)": GOSUB 100
6150 IF A$="Y" THEN  GOTO 6170 ELSE  IF A$<>"N" THEN  GOTO 6140
6160 GOTO 6000
6170 FOR I=1 TO NH: LPRINT RECORD$(RN,I): NEXT
6180 GOTO 6000
7000 REM expand file routine
7010 IF NR=0 THEN  GOSUB 600: GOTO 50
7020 CLS : INPUT "Number of records to add";NNR: IF NNR>E OR NNR<1 THEN  PRINT "
Out of range - try again": GOSUB 400: CLS : GOTO 7000
7030 LET E=E-NNR
7040 CLS : FOR I=NR+1 TO NNR+NR: CSR 11,0: PRINT FILE$;" Page ";I: FOR J=1 TO NH
7050 PRINT HEAD$(J): INPUT B$: IF LEN (B$)<40 THEN  LET RECORD$(I,J)=B$ ELSE  GO
TO 7050
7060 NEXT J: CLS : NEXT I: LET NR=NR+NNR
7070 CLS : PRINT "File enlarged as defined ": GOSUB 400: GOTO 40
8000 REM change password
8010 CLS : PRINT "Current password is :";ENTRY$
8020 PRINT : INPUT "New password (Maximum 6 letters) :";B$: IF LEN (B$)>6 THEN
PRINT "Too long - try again": GOSUB 400: GOTO 8020
8030 LET ENTRY$=B$: GOTO 50
9000 REM quit program
9010 CLS : PRINT "Are you certain you wish to exit ?      (Y or N)": GOSUB 100
9020 IF A$="Y" THEN  NEW  ELSE  IF A$="N" THEN  GOTO 50
9030 GOTO 50


WHEN ABOVE PROGRAM IS ENTERED TYPE IN '
NODDY' PAGES AS SET OUT BELOW.
TO ERASE THE PAGE TITLE FROM THE PABE T
YPE <HOME> FOLLLOWED BY <EOL> WHEN YOU
FIRST SET UP THE PAGE. THIS  WILL ERASE
 THE WORD FROM  THE PAGE BUT WILL STILL
 KEEP THE PAGE TITLE IN MEMORY
PR1 TO PR7 AND INT ARE ALL ON DIFFERENT
 NODDY PAGES, BUT FORMATTING THEM TO TH
E PRINTER WOULD LEAVE LARGE AREAS OF BL
ANK PAPER.


 PR1

    *D MENU1.*R
 PR7



    *D MENU7.*R
 PR2



    *D MENU2.*R
 PR3

    *D MENU3,*R
 PR4

    *D MENU4,*R
 PR5



    *D MENU5.*R
 PR6
```

```
   *D MENU6.*R
INT

   *D INTRO.*R

INTRO       INTRODUCTION
            ~~~~~~~~~~~~

This program has been designed for ease
of use, speed and simplicity.
All options are menu-driven, and most
only require a single key response.
If the cursor (flashing white square)
is on the screen, you will need to
press RETurn at the end of your entry,
such as when entering data.
For reasons of memory, the limit of the
record under each heading is 40
characters, so each page can be up to
320 characters (8 lines of 40). To
accomodate this the headings can be
empty strings.(No heading actually
defined-simply press RETurn when the
prompt appears.)
The limit of 150 records is set in
order to allow expansion up to 170
records.(MTX512).
This will allow up to 54,400 letters
or numbers to be stored.
MENU1       OPENING MENU
            ~~~~~~~~~~~~

Start new file..............Press F1

Save current file...........Press F2

Examine file in memory.......Press F3

Load a new file from tape....Press F4

Edit file in memory..........Press F5

Send records to printer......Press F6

Expand current file..........Press F7

Change entry code............Press F8

Quit program completely......Press 8/F1
                             (8=Shift Key)
MENU7       NEW FILE MENU
            ~~~~~~~~~~~~~

Open new file...............Press F1

Return to opening menu.........Press F2

              WARNING
              ~~~~~~~

When a new file is started, previous

file is lost, so if not already saved,


please do so now
 MENU2      SAVE MENU
            ~~~~~~~~~

 Save current file to tape........F1

 Return to opening menu...........F2
 MENU3    FILE VIEWING MENU
          ~~~~~~~~~~~~~~~~~~

 Examine a particular file.........F1

 List all current records..........F2

 Return to opening menu............F3
 MENU4      LOAD MENU
            ~~~~~~~~~

 Load file from tape.............Press F1

 Return to opening menu.........Press F2
 MENU5      EDITING MENU
            ~~~~~~~~~~~~

 Edit a record...................Press F1

 List all records................Press F2

 Change file name (same file)...Press F3

 Redefine a heading..............Press F4

 Return to opening menu.........Press F5
 MENU6      PRINTER OPTIONS
            ~~~~~~~~~~~~~~~

 Set printer to same as screen..Press F1

 Set Emphasised mode.............Press F2

    Both above are for Epson-type

                printers

 Print out all records..........Press F3

 Send headings to printer.......Press F4

 Print a particular record......Press F5

 Return to opening menu.........Press F6
```

Spectrum NAK

by Mark Summers

Yes, you guessed it, Not Another Kong! This is a fast-moving and difficult version, with people and gorillas running up and down ladders, eating bananas and generally acting the monkey. The program includes full instructions and a high-score table. The gorilla is very quick, so don't wait around.

When typing in the program, use the appropriate letter for the graphics characters given in the table at the end. The symbol that sometimes appears after the PRINT statement (looks like a verical line with a hook at the beginning) should be typed in as a # symbol. Some of the lines between 1200 and 1225 are very long and contain breaks; these should be typed in as if they were continuous.

```
   0>REM                                  >>>>   MA
RK SUMMERS 1985                           <<<<
   0>REM   COMPLETED ON                    17th APRIL
   1 PRINT AT 18,6; BRIGHT 1; INK 2; PAPER 6; FLASH 1;"PRESS ANY KEY TO PLAY"
   2 PAUSE 1: IF INKEY$="" THEN  BORDER 1: BORDER 2: BORDER 3: BORDER 4: BORDER
5: BORDER 6: BORDER 7: BORDER 0: GO TO 2
   3 PRINT AT 18,6;"                    ": POKE 23658,0: GO SUB 80
   4 GO SUB 1000
   6 DIM b$(10,10): DIM q(10): GO SUB 610
   9 RESTORE
  10 FOR f=USR "a" TO USR "h"+7: READ a: POKE f,a: NEXT f
  20 DATA 2,2,2,255,32,32,32,255
  21 DATA 66,66,126,66,66,66,126,66
  22 DATA 28,28,8,126,8,8,20,34
  23 DATA 255,24,126,255,153,255,66,60,24,24,126,255,153,255,66,60,60,126,219,25
5,195,195,126,60,60,126,219,255,255,126,60,0
  24 DATA 128,192,118,57,20,42,69,67
  30 BORDER 0: PAPER 0: INK 7: BRIGHT 0: INVERSE 0: OVER 0: GO SUB 40: GO TO 100
  40 CLS : INK 5: INVERSE 1: PRINT "                                          NOT
ANOTHER KONG!                                       ": PRINT AT 1,4; OVER 1;"━━
━━━━━━━━━━━━━━━━━━━━━━"
  45 PRINT '''" The object of the game is to    reach the top of the building
 with-out being captured by the  monster more than three times.  A bonus of "; I
NVERSE 0;"40"; INVERSE 1;" is received for   every banana colected.",: PRINT ''"
 On successful completion of       each screen you will receive a  bonus of "; INV
ERSE 0;"500"; INVERSE 1;" points.                "
  50 PRINT '" On completion of the four        screens you will be put back    on
 sheet one.               "
  55 INVERSE 0: INK 7: PRINT →0;AT 0,3;"PRESS KEY ~M~ TO CONTINUE."
  60 LET f=1: LET c=0
  65 PRINT AT 5,c;" ";AT 12,31-c;" ": LET c=c+f: BEEP .002,c+5: BEEP .002,c: PRI
NT AT 5,c;"▣";AT 12,31-c;"♠": IF c=31 OR c=0 THEN  LET f=-f
  70 IF INKEY$="m" THEN  RETURN
  75 PAUSE 10: PRINT AT 5,c;"♠";AT 12,31-c;"▣": PAUSE 10: GO TO 65
  80 RESTORE 80: FOR f=64100 TO 64125: READ a: POKE f,a: NEXT f: DATA 33,0,88,1,
3,0,126,198,1,230,7,95,126,198,8,230,56,131,119,35,16,240,13,32,237,201
  81 FOR f=64050 TO 64075: READ a: POKE f,a: NEXT f: DATA 33,128,88,1,2,32,126,1
98,1,230,7,95,126,198,8,230,56,131,119,35,16,240,13,32,237,201
  83 FOR f=60000 TO 60024: READ a: POKE f,a: NEXT f: DATA 33,200,21,6,40,0,17,0,
0,197,229,205,181,3,225,193,43,43,43,43,43,43,16,238,201
  85 FOR f=64000 TO 64016: READ a: POKE f,a: NEXT f: RETURN : DATA 33,0,64,1,0,2
4,203,6,203,134,35,11,120,177,32,246,201
  90 INVERSE 1: INK 6: PRINT AT 0,0;"
 K E Y S                                        "
  91 PRINT AT 1,4; OVER 1;"━━━━━━━━━━━━━━━━━━━━━━━━"
  92 PRINT AT 7,0;"              UP    2                          LEFT  9
             RIGHT 0             ",,
  94 INVERSE 0: INK 7: PRINT →0;AT 0,4;"PRESS KEY ~M~ TO CONTINUE."
  95 LET f=10
  96 PRINT AT 6,0;"▣";AT 6,31;"▣";AT 11,0;"♠";AT 11,31;"♠";→0;AT 0,0;"▣";→0;AT
 0
,31;"▣": BEEP .003,f: LET f=10
  97 IF INKEY$="m" THEN  RETURN
  98 PAUSE 15: PRINT AT 6,0;"♠";AT 6,31;"♠";AT 11,0;"▣";AT 11,31;"▣";→0;AT 0,0
;"
♠";→0;AT 0,31;"♠": BEEP .003,f: LET f=20: PAUSE 15: GO TO 96
  99 FOR f=1 TO 8: POKE 60002,10-f: LET dummy=USR 60000:: LET dummy=USR 64000: B
EEP .002,f*5: NEXT f: RETURN
 100 IF INKEY$<>"" THEN  BEEP .002,42: GO TO 100
 105 GO SUB 99: GO SUB 90
 110 IF INKEY$<>"" THEN  BEEP .002,42: GO TO 110
 115 GO SUB 99
 123 REM ***********************
 125 LET p=1: LET l=3: LET s=0: LET h=q(1)
 130 CLS : PRINT →0;AT 0,0; INK 5; PAPER 1;"   ~SCORE~     ~HIGH~    ~LIVES~
00000       0000      🯅 🯅 🯅   "
 131 PRINT AT 0,0; BRIGHT 1; INK 2; PAPER 6;" SHEET NUMBER : ";p,
 132 PRINT →0;AT 1,24; INK 8; PAPER 8;"        ";AT 1,24;"★ ★ ★ "( TO l*2);"  ";A
T
 1,9-LEN STR$ s; INK 8; PAPER 8;s;AT 1,19-LEN STR$ h; INK 8; PAPER 8;h
 135 PRINT AT 21,0; INK 6; PAPER 2; BRIGHT 1;"≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠≠
≠≠≠≠≠≠≠"
 140 LET a=20: LET b=1: LET a$="‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡‡"
 145 LET c=8: LET d=31: LET a=20: LET b=1
 150 IF p>=5 THEN  STOP
 155 RESTORE 500+(p-1)*20
 160 READ w: FOR f=1 TO w: INVERSE 0: READ x,y,z: PRINT AT x,y; INK 6; PAPER 2;
BRIGHT 1;b$( TO z): NEXT f
 165 READ w: FOR f=1 TO w: READ x,y: PRINT AT x,y; INK 5;"H";AT x+1,y;"H";AT x+
2
,y;"H": NEXT f
 170 READ w: FOR f=1 TO w: READ x,y: PRINT AT x,y; INK 6;"%": NEXT f
 175 GO TO 200
 180 PRINT AT a,b; INK 8; PAPER 8; FLASH 8;"🯅";AT c,d;"♠": RESTORE 180
 181 DATA 12,12,15,16,19,19,21,19,12,24,22,21,19,17,16,14,12,12,15,16,19,19,21,1
9,12,24,22,21,19,17,16,14,17,17,20,21,24,24,26,24,17,24,22,21,19,17,16,14,12,12,
15,16,19,19,21,19
 182 DATA 12,24,22,21,19,17,16,14,19,19,23,24,26,26,24,23,17,17,20,21,24,24,20,2
1,12,12,15,16,19,19,21,19,12,24,22,21,19,17,16,14,255
```

```
 184 LET z=4
 185 PRINT  BRIGHT 1;AT 1,5; INK z;"PRESS ANY KEY TO START": LET z=z+1: IF z=8 T
HEN  LET z=4
 190 READ x: IF x=255 THEN  RESTORE 180: GO TO 185
 195 BEEP .1,x: IF INKEY$<>"" THEN  RETURN
 197 GO TO 190
 200 GO SUB 180
 210 PRINT AT 1,5;"                              "
 215 PRINT AT 1,30; FLASH 1; INK 2; PAPER 6;"\/";AT 2,30;"/\"
 219 LET d$="◆◆◆◆": LET c1=c: LET d1=d: LET a1=a: LET b1=b
 220 FOR g=1 TO 2: LET a=a1: LET b=b1: LET c=c1: LET d=d1
 222 IF a<=2 THEN  IF b>=30 THEN  GO TO 900
 225 GO SUB 400
 230 LET d1=d+(b>d)-(b<d)
 235 LET c1=c+3*(((a+1)>c AND ATTR (c+1,d)=5)-((a+1)<c AND ATTR (c-2,d)=5))
 240 IF ATTR (c1+1,d)=7 THEN  LET c1=c1+3
 250 IF a=c1 THEN  IF b=d1 THEN  GO TO 850
 255 PRINT AT c,d; OVER 1; INK 8; PAPER 8; BRIGHT 8; FLASH 8;d$(g);AT c1,d1;d$(g
+1)
 260 NEXT g: GO TO 220
 400 IF INKEY$="2" AND ATTR (a-1,b)=5 THEN  LET a1=a-3: FOR f=40 TO 60 STEP 4: B
EEP .05,f: NEXT f
 405 LET b1=b+(INKEY$="0" AND b<31)-(INKEY$="9" AND b>0)
 410 IF ATTR (a,b)=6 THEN  GO SUB 600
 415 IF ATTR (a+1,b)=7 OR ATTR (a1+1,b1)=7 THEN  LET a1=a+3: FOR f=60 TO 40 STEP
 -4: BEEP .002,f: NEXT f
 420 PRINT AT a,b; INK 8; PAPER 8; OVER 1; FLASH 8;"+";AT a1,b1;"+": RETURN
 500 DATA 15,18,7,12,15,1,9,15,17,15,12,6,12,12,20,7,12,30,2,9,29,3,9,23,4,9,11,
10,9,0,7,6,4,5,3,12,20,6,9,11,3,0,9,3,28,4
 505 DATA 15,3,13,3,18,9,13,6,4,3,6,9,6,9,23,12,9,6,15,12,26,12,30,15,7,15,18,18
,9,18,18
 510 DATA 14,8,19,8,26,2,1,20,28,17,10,17,14,14,2,11,9,11,16,11,21,11,31,8,1,2,1
5,14,31
 520 DATA 18,3,0,10,6,0,4,18,0,5,15,2,11,12,5,2,9,2,4,9,7,12,6,7,7,3,13,7,6,17,8
,12,15,17,15,15,7,18,7,13,18,24,5,15,25,7,9,24,7,6,27,5,3,28,4
 525 DATA 18,18,8,18,26,15,3,15,10,15,18,15,28,12,21,12,26,9,5,9,17,6,3,6,8,6,24
,6,30,3,1,3,13,3,18,3,28
 530 DATA 15,17,1,17,15,17,24,20,30,14,7,14,30,11,6,11,15,11,30,5,11,5,22,5,31,2
,4,2,8,2,29
 540 DATA 16,3,1,14,3,17,15,6,8,12,6,25,5,9,0,16,9,18,8,9,28,4,12,4,6,12,17,4,12
,26,6,15,1,2,15,8,8,15,24,7,18,0,10,18,12,12,18,26,4
 545 DATA 15,3,9,3,27,6,11,6,18,6,29,9,5,9,28,12,9,12,27,15,2,15,8,15,15,15,26,1
8,13,18,28
 550 DATA 15,2,1,2,17,5,16,5,25,8,1,8,30,11,19,11,26,11,30,14,1,14,30,17,9,17,18
,17,27,20,18
 560 DATA 26,18,1,7,18,9,2,18,12,8,18,24,5,18,30,2,15,0,2,15,4,6,15,12,8,15,24,7
,12,0,5,12,9,4,12,15,12,12,28,2,9,0,5,9,7,3,9,13,10,9,25,2,9,29,3,6,3,4,6,8,6,6,
15,3,6,20,6,6,27,4,3,3,13,3,17,10,3,29,3
 565 DATA 20,18,10,18,14,18,31,15,1,15,13,15,27,15,30,12,0,12,9,12,18,12,29,9,4,
9,26,6,3,6,13,6,25,3,6,3,15,3,17,3,30
 570 DATA 20,20,4,20,21,17,7,17,9,17,25,17,31,14,6,14,12,14,26,11,15,11,28,8,0,8
,8,8,19,8,26,8,30,5,10,5,27,2,3,2,23
 600 BEEP .02,10: BEEP .03,15: PRINT AT a,b; OVER 1;"×"
 605 LET s=s+40: PRINT ~0;AT 1,9-LEN STR$ s; INK 5; PAPER 1;s; RETURN
 610 RESTORE 610: FOR f=1 TO 10: READ b$(f): LET q(f)=12000-(1000*f+10*INT (RND*
100)): NEXT f
 615 DATA "MARK","MARTIN","MICROMAD","SID","GERTIE","PAC-MAN","SPUD","RICK","BLO
B","MIKE"
 620 RETURN
 700 PRINT AT a1,b1; INK 8; PAPER 8; FLASH 8;;"*";AT a1,b1;"◆";AT c,d;" ";AT c1
,
d1;" ": BEEP 1,10: BEEP 1,20
 705 GO SUB 99
 710 CLS : PRINT  PAPER 3;AT 7,5;"                              ";AT 8,5;"      GAME  O
VER      ";AT 9,5;"                "
 715 PRINT ~0;AT 1,4;"PRESS ANY KEY TO CONTINUE"
 720 IF INKEY$="" THEN  BEEP .002,42: GO TO 720
 725 GO SUB 99: CLS
 730 FOR f=1 TO 10: IF s>q(f) THEN  GO TO 802
 735 NEXT f
 750 PRINT AT 1,9; PAPER 3; INVERSE 1;" HALL OF FAME "
 800 GO TO 805
 802 FOR g=10 TO f+1 STEP -1: LET q(g)=q(g-1): LET b$(g)=b$(g-1): NEXT g: LET q(
f)=s: POKE 23658,8: INPUT "CONGRATULATIONS! A HIGH SCORE!  ENTER YOUR NAME(< 10
CHARACTERS)"; LINE b$(f)
 810 POKE 23658,0: PRINT AT 1,9; INVERSE 1;" HALL OF FAME ""'': FOR f=1 TO 10: P
RINT TAB 8; BRIGHT 1; INK f/2+2;b$(f);" ";"00000";AT f+3,25-LEN STR$ q(f); BRIGH
T 1; INK f/2+2;;q(f): NEXT f
 814 PRINT AT 16,0; INVERSE 1; INK 6; PAPER 2;," YOUR SCORE :",s,,,
 815 FOR f=1 TO 7: BEEP .001,f*4: PRINT ~0;AT 1,4; INK f;"PRESS KEY ~M~ TO CONTI
NUE"
 820 IF INKEY$="m" THEN  GO TO 830
 825 NEXT f: GO TO 815
 830 GO SUB 99: CLS : INK 3: INVERSE 1: PRINT ,,"    DO YOU WANT ANOTHER GO ?
 ",,
 835 PRINT '',,"            YES OR NO             ",,: INVERSE 0: RESTORE 180
 837 GO SUB 930
 840 READ x: IF x=255 THEN  RESTORE 180: GO TO 840
 842 IF INKEY$="n" THEN  GO TO 1350
 845 BEEP .07,x-30: PRINT AT 13,x; INK 2; PAPER 6; FLASH 1; OVER 1;" ": LET g=x:
 READ x: BEEP .07,x-30: PRINT AT 13,g; INK 0; PAPER 7; OVER 1;" ": IF INKEY$<>"y
" THEN  GO TO 840
 847 INK 7: BRIGHT 0: PAPER 0: BORDER 0: GO SUB 99: CLS : GO TO 120
 849 STOP
 850 PRINT AT a,b;" ";AT c,d;" ": PRINT AT a1,b1;"*";AT a1,b1;.OVER 1;"◆"
 855 LET l=l-1
 860 IF INKEY$<>"" THEN  GO TO 860
 865 IF l<=0 THEN  GO TO 700
 870 PRINT AT a,b; INK 8; PAPER 8; OVER 1;" ";AT c,d;" "
 875 LET a=20: LET b=1: LET c=9: LET d=31: GO SUB 99: GO TO 130
 900 FOR f=1 TO 3: FOR g=0 TO 20 STEP f: RANDOMIZE USR 64100: BEEP .02,f*g: BORD
ER g/7: NEXT g: NEXT f: BORDER 0
 905 PRINT ~0;AT 0,0; INK 2; INVERSE 1,,"   STAGE NUMBER ";p;" COMPLETED",,,
 907 IF p=4 THEN  GO SUB 1300: LET s=s+1000
 910 PRINT AT 7,0; INK 6; INVERSE 1,,"   PRESS KEY ~M~ TO CONTINUE    ",,'' INK
 4,,("     500  POINTS BONUS ! ! !     " AND p<4),,
 915 IF INKEY$<>"m" THEN  BEEP .001,42: GO TO 915
 920 LET s=s+500*(p<4): LET p=p+1: IF p>4 THEN  LET p=1
 925 GO TO 130
 930 PRINT AT 10,2; INK 0; PAPER 7;" ■ ■  ■ ■ ■  ■ ■  ■ ■ ■  ■ ■ "
 935 PRINT AT 11,2; INK 0; PAPER 7;" ■ ■  ■ ■ ■  ■ ■  ■ ■ ■  ■ ■ "
 940 PRINT AT 12,2; PAPER 7; INK 0;"                              "
 945 PRINT AT 13,2; PAPER 7; INK 0;"
 950 FOR f=23 TO 239 STEP 8: PLOT f,64: DRAW  INK 0; PAPER 7;0,31: NEXT f
 955 PLOT 15,64: DRAW 0,32: DRAW 225,0: DRAW 0,-33: DRAW -225,0: RETURN
```

```
1000 RESTORE 1000: FOR f=USR "a" TO USR "r"+7: READ a: POKE f,a: NEXT f: RESTORE

1020 DATA 1,7,7,15,13,15,15,15,128,224,224,240,176,240,240,240,0,1,7,15,31,63,12
7,63,255,255,255,255,255,255,255,255,252,255,255,255,255,255,255,255,0,128,224,2
40,248,248,252,254
1030 DATA 127,251,243,241,241,121,120,124,223,255,255,255,255,255,255,127,251,25
5,255,255,255,255,255,254,254,223,207,143,143,158,30,62,56,1,7,15,15,31,31,31,12
7,255,255,255,255,255,252,224,254,255,255,255,255,255,63,7,28,128,224,240,240,24
8,248,248,31,31,15,15,15,15
1040 DATA 31,63,192,128,0,0,0,0,0,0,1,1,0,0,0,0,0,0,248,240,240,240,240,248,252,
255
1150 BORDER 7: PAPER 7: INK 2: CLS
1200  FOR f=15 TO 0 STEP -1: BEEP .03,-35: PRINT AT f,1;"  ≛⊟ ";AT f+1,1;" ⾋♨⊗
"
;AT f+2,1;" ⊗✕▰◪ NOT";AT f+3,1;" ▰▰▰     ";AT f+4,1;" ⌶  ⌊";AT f+5,1;"
": B
EEP .03,-30: NEXT f
1205  FOR f=1 TO 16: BEEP .03,-35: PRINT AT f-1,1;"      ";AT f,1;"  ≛⊟ ";AT f+
1
,1;" ⾋♨⊗⊗";AT f+2,1;" ⊗✕▰◪";AT f+3,1;" ▰▰▰     ";AT f+4,1;" ⌶  ⌊": BEEP .0
3,-30:
 NEXT f
1210  FOR f=1 TO 11: BEEP .03,-35: PRINT AT 16,f;"  ≛⊟ ";AT 17,f;" ⾋♨⊗⊗";AT 18
,f
;" ⊗✕▰◪";AT 19,f;" ▰▰▰     ";AT 20,f;" ⌶  ⌊": BEEP .03,-30: NEXT f
1215  FOR f=15 TO 0 STEP -1: BEEP .03,-35: PRINT AT f,11;"  ≛⊟ ";AT f+1,11;" ⾋♨
⊗
⊗";AT f+2,11;" ⊗✕▰◪ ANOTHER";AT f+3,11;" ▰▰▰          ";AT f+4,11;" ⌶  ⌊";AT
 f+5,
11;"      ": BEEP .03,-30: NEXT f
1220  FOR f=1 TO 16: BEEP .03,-35: PRINT AT f-1,11;"      ";AT f,11;"  ≛⊟ ";AT
f
+1,11;" ⾋♨⊗⊗";AT f+2,11;" ⊗✕▰◪";AT f+3,11;" ▰▰▰     ";AT f+4,11;" ⌶  ⌊": B
EEP .0
3,-30: NEXT f


1225 LET b$=" PRESS ANY KEY ": LET a$=" ▌  ▗▘ ▗▀▀▀▖ ▙  ▌ ▗▀▀▀▖
   ▌ ▗▘  ▌
 ▌ ▌ ▚ ▌ ▌                       ▙▘   ▌   ▌ ▌ ▌ ▌ ▌ ▬                       ▌▚
▌    ▌ ▌ ▌▌▙    ▌
           ▌ ▚ ▌    ▌ ▌ ▚▙ ▌    ▌                        ▪   ▪  ▬▬▬  ▪   ▪ ▬▬▬"

1227 PRINT AT 6,5;a$
1230 FOR f=0 TO 6: BEEP .003,f*3: PRINT ~0; INK 8-f;AT 1,8;b$: LET b$=b$(2 TO )+
b$(1): LET dummy=USR 64050
1235 IF INKEY$="" THEN  BEEP .01,f*3: NEXT f: GO TO 1230
1240 FOR f=0 TO 7: LET dummy=USR 64000: NEXT f: RETURN
1300 RESTORE 1300: PRINT AT 7,0; INK 7; PAPER 3; BRIGHT 1,,"       CONGRATULATIO
NS!         ",,
1301 FOR f=1 TO 44: READ x,y: BEEP x/20,y: NEXT f
1302 DATA 2,7,2,9,2,11,6,12,8,7,2,12,2,11,2,12,6,14,8,9,2,9,2,11,2,12,2,16,2,14,
2,14,2,12,2,12,2,11,2,9,2,11,8,7,2,7,2,9,2,11,6,12,8,7,2,12,2,11,2,12,6,14,8,9,2
,9,2,11,2,12,3,16,1,14,2,14,2,12,2,12,2,11,2,9,2,11,8,12
1305 PRINT '': PRINT  BRIGHT 1; INK 0; PAPER 4,,"         PRESS ANY KEY
 ",,
1310 IF INKEY$="" THEN  LET dummy=USR 64100: POKE 60002,2+INT (RND*5): LET dummy
=USR 60000: GO TO 1310
1315 FOR f=0 TO 7: POKE 60002,f+3: LET dummy=USR 60000: LET dummy=USR 64000: NEX
T f: PAUSE 50: CLS
1320 PRINT AT 5,0; INK 1; PAPER 6; BRIGHT 1,,"          SUPER BONUS          ",
,''',,"          1000          ",,"          POINTS          ",,
1325 FOR f=0 TO 14: LET dummy=USR 64100: BEEP .05,f: BEEP .05,-f: NEXT f: CLS :
RETURN
1350 RESTORE 1350: FOR f=USR "u" TO USR "u"+7: READ a: POKE f,a: NEXT f: DATA 80
,112,80,94,8,14,2,14
1355 GO SUB 99: CLS
1360 GO SUB 1500
1370 FOR f=9 TO 20 STEP 2: FOR g=0 TO 31 STEP 2: PRINT AT f+1,g;"υ";AT f,g+1;"υ
"
: NEXT g: NEXT f
1375 PRINT AT 21,0;" υ υ υ υ υ υ υ υ υ υ υ υ υ υ υ"
1380 PRINT ~0;AT 1,0;"  MARK SUMMERS  APRIL 1985  "
1400 LET as=1: LET bs=1: LET a=9: LET b=0
1401 FOR f=1 TO 373: PRINT  BRIGHT 1; INK 6; PAPER 2; OVER 1;AT a,b;"υ"
1403 BEEP .003,a+b-(b-a)
1405 IF a<10 THEN  LET as=1
1407 IF b<1 THEN  LET bs=1
1410 IF a>20 THEN  LET as=-1
1412 IF b>30 THEN  LET bs=-1
1415 LET a=a+as: LET b=b+bs: NEXT f

1420 LET a$=" ▗▀▀▖▗▀▀▖▗▀▀▖▛▀▀▖  ▛▀▀▖▌  ▌▛▀▀▀  ▌   ▌  ▌▌  ▌▌  ▌  ▌
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 ▬▬▬ ▬▬▬ ▬▬▬ ▬▬▬
▬▬▬   ▪  ▬▬▬▬ "
1422 POKE 64051,0: POKE 64054,1: POKE 64055,224
1423 PRINT AT 1,0;a$
1425 RESTORE 180
1430 READ a: IF a=255 THEN  STOP
1431 BEEP .02,a: RANDOMIZE USR 64050: GO TO 1430
1500 INK 0: PAPER 0

1505 LET f=11: PRINT AT f,4;"■      ■   ■ ■ ■ ■   ■    ■";AT f+2,4;"■ ■
 ■   ■
   ■    ■ ■";AT f+4,4;"■    ■ ■    ■ ■ ■ ■   ■ ■";AT f+6,4;"■      ■
■      ■   ■
■"
1510 INK 7: RETURN
9998 PAUSE 0: BORDER 7: PAPER 7: INK 0: CLS
9999 SAVE CHR$ 8+CHR$ 8+CHR$ 8+CHR$ 8+CHR$ 8+" NAK1" LINE 0

A=≛ B=⊟ C=⾋ D=♨ E=⊗ F=⊗ G=⊗ H=✕
I=▰ J=◪ K=▰ L=▰ M=▰ N=▰ O=⌶ P=
Q=  R=⌊
```

Commodore 64 Renumber

by Eric Corbett

Although there are innumerable programs for renumbering other Basic programs, this one works well on all GOTOs, GOSUBs, and so on. It is also very short, and occupies a mere 505 bytes of otherwise unused RAM from 49152 to 49656. To use the program, type it in, save before running, and then run it. You can now type NEW, and type or load in any Basic program. When you want to renumber a program, type SYS 49160 and the current Basic program will be neatly renumbered in steps of 10.

Any references to undefined line numbers will be altered to refer to a point after the end of the program.

```
10 REM ---------------------------------
20 REM  THIS IS A MACHINE CODE ROUTINE
30 REM   TO RENUMBER BASIC PROGRAMS.
40 REM
50 REM   ALL GOTOS, GOSUBS, ETC ARE
60 REM   ADJUSTED.
70 REM
80 REM (C) ERIC CORBETT 1985
90 REM ---------------------------------
100 FOR I=49152 TO 49656
110 READ A
120 POKE I,A
130 NEXT
140 DATA 131,164,18,9,0,0,0,0,169,255
150 DATA 133,20,133,21,173,2,3,141,0
160 DATA 192,173,3,3,141,1,192,169,36
170 DATA 141,2,3,169,192,141,3,3,230
180 DATA 20,208,2,230,21,32,19,166,160
190 DATA 1,177,95,240,47,200,177,95,133
200 DATA 20,200,177,95,133,21,162,4,200
210 DATA 177,95,240,19,201,137,240,114
220 DATA 201,141,240,110,201,167,240
230 DATA 106,232,157,251,1,76,63,192
240 DATA 169,0,232,157,251,1,134,11,76
250 DATA 164,164,169,10,133,253,169
260 DATA 0,133,254,165,43,141,2,192
270 DATA 165,44,141,3,192,173,2,192
280 DATA 133,251,173,3,192,133,252
290 DATA 160,1,177,251,240,39,200
300 DATA 165,253,145,251,200,165,254
310 DATA 145,251,169,10,24,101,253
320 DATA 133,253,169,0,101,254,133
330 DATA 254,160,0,177,251,141,2,192
340 DATA 200,177,251,141,3,192,76
350 DATA 116,192,173,0,192,141,2,3
360 DATA 173,1,192,141,3,3,76,116
370 DATA 164,232,157,251,1,200,177
380 DATA 95,240,148,201,32,208,7,232
390 DATA 157,251,1,76,190,192,140
400 DATA 5,192,169,0,133,251,133,252
410 DATA 141,7,192,177,95,240,119,201
420 DATA 58,240,115,201,32,240,111,201
430 DATA 44,240,107,201
440 DATA 48,144,4,201,58,144,46,172,5
```

```
450 DATA 192,177,95,208,3,76,87,192
460 DATA 232,157,251,1,201,127,144,11
470 DATA 201,141,240,182,201,137,240
480 DATA 178,141,7,192,201,58,240,171
490 DATA 201,44,208,5,173,7,192,240
500 DATA 162,200,76,245,192,56,233
510 DATA 48,72,6,251,38,252,165,251,133
520 DATA 253,165,252,133,254,6,251,38
530 DATA 252,6,251,38,252,24,165,251
540 DATA 101,253,133,251,165,252,101
550 DATA 254,133,252,104,24,101,251
560 DATA 133,251,165,252,105,0,133
570 DATA 252,200,76,218,192,140,4,192
580 DATA 142,6,192,165,20,133
590 DATA 253,165,21,133,254,169,255,133
600 DATA 20,133,21,169,0,141,2,192,141
610 DATA 3,192,230
620 DATA 20,208,2,230,21,32,19,166,24
630 DATA 173,2,192,105,10,141,2,192,173
640 DATA 3,192,105,0,141,3,192,160,1
650 DATA 177,95,240,20,200,177,95,133
660 DATA 20,200,177,95,133,21,197,252
670 DATA 208,210,165,20,197,251,208,204
680 DATA 165,253,133,20,165,254,133,21
690 DATA 32,19,166,174,6,192,169,13,72
700 DATA 160,16,169,0,14,2,192,46,3,192
710 DATA 42,201,10,144,5,233,10,238,2
720 DATA 192,136,208,237,201,10,144,2
730 DATA 105,6,105,48,72,173,2,192,13
740 DATA 3,192,208,216,104,201,13,240
750 DATA 7,232,157,251,1,76,222,193,172
760 DATA 4,192,177,95,201,44,240,3,76
770 DATA 64,192,76,186,192
```

APC is interested in programs written in any of the major programming languages for all home and small business micros. When submitting programs please include a cassette or disk version of your program, brief but comprehensive documentation and a listing on plain white paper — typed if you have no printer.

Please ensure that the software itself, the documentation and the listing are all marked with your name, address, program title, machine (along with any minimum requirements) and — if possible — a daytime phone number.

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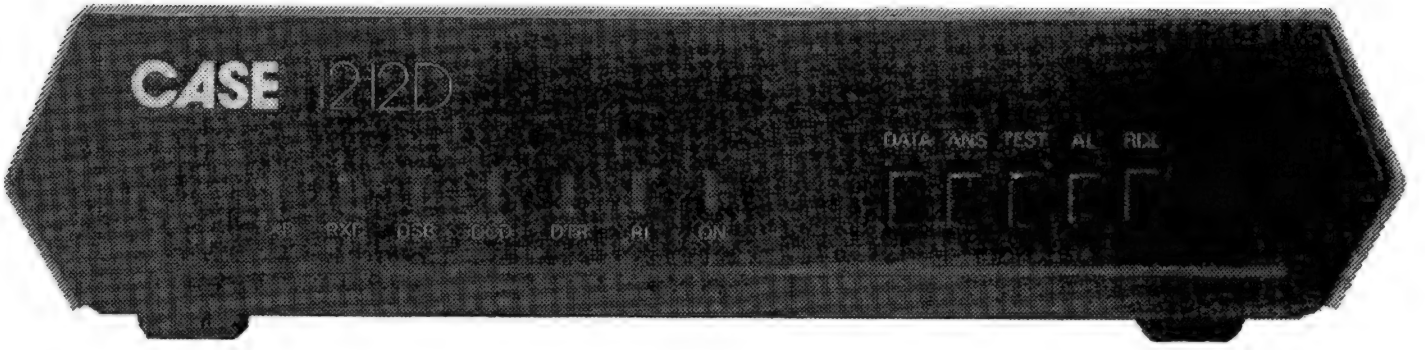

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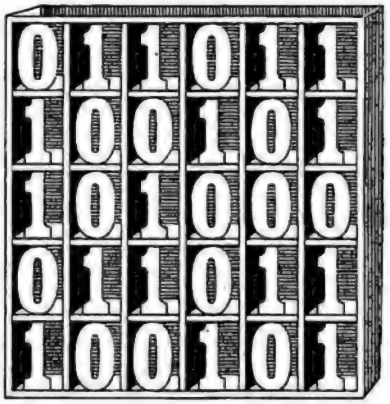

David Barrow presents more documented machine code routines and useful information for the assembly language programmer. If you have a good routine, an improvement or conversion of one already printed, or just a helpful programming hint, then send it in and share it with other programmers. Subroutines for any of the popular processors and computers are welcome but please include full documentation. All published code will be paid for. Send your contributions to Sub Set, APC, 2nd floor, 215 Clarence Street, Sydney 2000.

EPSON SCREEN DUMPS

The request for the shortest screen dump routine in each popular code produced a hefty response in Z80 and 6502, with one 8066 routine but no 6809 or 68000 code!

The screen dump problem is that most screen formats treat each byte of data as a horizontal sequence of dots. Epson dot-matrix printers, on the other hand, expect each byte of bit-image data to encode a vertical strip of eight dots. The solution is to take a column of eight screen bytes (one eight by eight dot-matrix, often corresponding to an alphanumeric character) and twist it around, or transpose it. Every routine seems to use a different variation on this basic transposition method.

Z80 DUMP

Z80 code poured in and ranged in length from a very sophisticated 570-byte program from T Hayes which dumps various formats in different print densities, to this 80-byte DUMP80 from J Kerr.

John makes a good attempt at generality by inputting the line and character-width counts, and the screen/start address, rather than having them programmed in. To cut down on byte use, the character width doubles as displacement to the next vertically adjacent screen byte, and its (assumed zero) high-order byte is used to effect a one-byte ADD Cy. Unfortunately, this generality is spoilt by DUMP80 setting an 80-dot margin whatever the screen width.

DATASHEET 1

```
;
;= DUMP80      Dump bit mapped screen to Epson standard printer.
;
;JOB           To produce a normal-density Bit Image screen dump
;              from a memory mapped screen to an Epson dot matrix
;              printer (or other printer accepting Epson control
;              codes), with a 4/3" left margin (centering a 320
;              dot wide dump on standard 241 mm paper).
;ACTION        For each screen line of 8 dot rows:
;              [ Set 8/72" line spacing.
;                Set normal density bit image mode.
;                Output data number = 8 x characters + 80.
;                Output 80 zero bit images for 4/3" margin.
;                For count of characters per line:
;                [ For bit count of 8:
;                  [ Save screen pointer.
;                    For line rows count of 8:
;                    [ Rotate screen byte left 1 bit.
;                      Shift output bit left into accumulator.
;                      Address screen one dot row higher. ]
;                    Restore screen pointer.
;                    Output bit image. ]
;                  Address next character. ]
;                Output carriage-return.
;                Address next line, 1st dot row, 1st byte. ]
;
;CPU           Z80
```

```
;HARDWARE      Screen RAM. The screen memory mapping must be such
;              that every bit controls one pixel and each
;              successive row of displayed bytes follows
;              contiguously from the last (no undisplayed
;              margins).
;              Epson standard (FX, MX or RX) printer. Must be set
;              to line-feed automatically on carriage-return.
;SOFTWARE      PRNTER - Epson printer driver, should preserve all
;              register contents.
;
;INPUT         HL addresses first byte of screen RAM (low memory).
;              BC = screen lines (vertical dots ÷ 8).
;              DE = screen line width (horizontal dots ÷ 8).
;                   (BC and DE assumed less than 256)
;OUTPUT        HL addresses last byte + 1 of screen RAM.
;              BC = 0. DE unchanged. AF changed.
;ERRORS        Single line dump of entire screen will occur unless
;              the printer automatically line-feeds on 0DH code.
;              Unchecked use of 0 as a zero value.
;
;RES USE       AF BC DE HL
;STACK USE     4 + PRNTER stack use.
;RAM USE       None.
;LENGTH        80
;CYCLES        Not given.
;
;CLASS 2       -discreet      +interruptable     +premable
;-++---        -reentrant     -relocatable       -robust
;
;
DUMP80 PUSH  HL          ;Save HL and use to address    E5
       LD    HL,STRING   ;Epson code sequences.         21 lo hi
       LD    B,5         ;Count 5 codes.                06 05
ESCSEQ LD    A(HL)       ;initialise printer to         7E
       CALL  PRNTER      ;8/72" line feed and select    CD lo hi
       INC   HL          ;normal density bit image      23
       DJNZ  ESCSEQ      ;mode.                         10 F9
;
       LD    H,0         ;Calculate bits data bytes     62
       LD    L,E         ;for one line of dump.         6B
       ADD   HL,HL       ;Number of data bytes is       29
       ADD   HL,HL       ;screen character width x 8    29
       ADD   HL,HL       ;+ 80 for left margin.         29
       LD    A,L         ;Set screen horizontal dots    7D
       LD    B,80        ;+ margin dots as low order    06 50
       ADD   A,B         ;byte to send to printer.      80
       CALL  PRNTER      ;Send no. of data low byte.    CD lo hi
       LD    A,H         ;Set high order byte (with     7C
       ADC   A,0         ;any carry from margin add)    8A
       CALL  PRNTER      ;and send to printer.          CD lo hi
;
       SUB   A           ;Clear A for sending nulls.    97
MARGIN CALL  PRNTER      ;Send 80 zero bytes to         CD lo hi
       DJNZ  MARGIN      ;printer for left margin.      10 FB
       LD    B,E         ;Set B = screen byte width.    43
       POP   HL          ;Restore screen pointer.       E1
;
SQUARE PUSH  BC          ;Save char. & line counts.     C5
       LD    C,8         ;Count 8 horizontal bits.      0E 08
;
COLUMN PUSH  HL          ;Save screen pointer.          E5
       LD    B,8         ;Count 8 vertical bits.        06 08
;
ONEDOT RLC   (HL)        ;Rotate screen byte, rotate    CB 06
       ADC   A,A         ;next bit into A, repeat       8F
       ADD   HL,DE       ;for 8 vertically adjacent     19
       DJNZ  ONEDOT      ;bytes of screen RAM.          10 FA
;
       POP   HL          ;Restore screen pointer.       E1
       CALL  PRNTER      ;Output bit data byte.         CD lo hi
       DEC   C           ;Repeat for 8 bits in each     0D
       JR    NZ,COLUMN   ;of 8 bytes.                   20 FD
;
       INC   HL          ;Address next column byte      23
       POP   BC          ;and repeat for full width     C1
       DJNZ  SQUARE      ;of screen.                    10 E9
;
       LD    A,0DH       ;Output carriage-return        3E 0D
       CALL  PRNTER      ;ready for next line.          CD lo hi
;
       LD    B,7         ;Screen pointer is at start    06 07
NEWROW ADD   HL,DE       ;of 2nd dot row, move to       19
       DJNZ  NEWROW      ;1st dot row of next line.     10 FD
;
       DEC   C           ;Repeat full operation         0D
       JR    NZ,DUMP80   ;for each character line       20 B6
```

```
        RET                 ;of screen, then exit.          C9
;
;...Code sequences to set 8/72" line spacing and select normal
;...density bit image mode (60 dots per inch). Bit image mode
;...sequence must be followed by 2-byte value (low order byte
;...first) giving number of bit data bytes to follow.
STRING DEFB  1BH,41H,8      ;ESC A 8 (line space).          1B 41 08
       DEFB  1BH,4BH        ;ESC K (bit image mode).        1B 4B
;
```

6502 DUMP

The shortest 6502 code at 87 bytes from W Anderton, had to be disqualified for relying on a couple of absent subroutines to do much of the work. This is a pity since Mr Anderton, with tongue firmly in cheek, named his routine PRINTER and sent his print data straight to his Apple's memory-mapped peripheral device.

The one shown here, DUMP65 from M Dunn is not quite as versatile as J Kerr's DUMP80. The 40-character width is encoded in the routine. The number of lines to dump, however, is variable because Matthew wrote the routine to dump screens in several of his Atari's graphics modes (for example, modes 3,5,7,7+) where bit-pairs are grouped to define colour and thus take up differing amounts of memory. ATARIB provides an entry to DUMP65 from Atari Basic.

DATASHEET 2

```
;=============================================================
;= DUMP65     Dump bit mapped screen to Epson standard printer.
;> ATARIB     Entry to DUMP65 from Atari Basic.
;=============================================================
;JOB          To produce a normal-density Bit Image screen dump
;             from a memory mapped screen to an Epson dot matrix
;             printer (or other printer accepting Epson control
;             codes), with a 1" left margin.
;ACTION       Set 8/72" line spacing.
;             For each screen line:
;             [ Output 10 character spaces for 1" margin.
;               Clear character index.
;               Set normal density bit image mode: 320 bit data.
;               For screen characters 0 to line-end:
;               [ For count of 8 dot rows:
;                 [ Copy current dot row byte to accumulator.
;                   For bit data store bytes 0 to 7:
;                   [ Shift accumulator left 1 bit.
;
;                     Rotate bit left into current store byte. ]
;                   Address next higher dot row. ]
;                 For bit data store bytes 0 to 7:
;                 [ Output bit data store byte. ]
;                 Index next character. ]
;               Output carriage-return. ]
;-------------------------------------------------------------
;CPU          6502
;HARDWARE     Atari computer for entry at ATARIB.
;             Screen RAM. The screen memory mapping must be such
;             that every bit controls one pixel and each
;             successive row of displayed bytes follows
;             contiguously from the last (no undisplayed
;             margins).
;             Epson standard (FX, MX or RX) printer. Must be set
;             to line-feed automatically on carriage-return.
;SOFTWARE     PRNTER - Epson printer driver, should preserve all
;             register contents.
;-------------------------------------------------------------
;INPUT        M0 = number of screen lines (dot rows ÷ 8).
;             M2,3 Addresses 1st byte of screen memory.
;OUTPUT       P, A, X, Y and M0 to M3 are changed.
;ERRORS       Single line dump of entire screen will occur unless
;             the printer automatically line-feeds on $0D code.
;REG USE      P A X Y
;STACK USE    4 + PRNTER stack use.
;RAM USE      M0 to M3
;LENGTH       125 (+ 16 for ATARIB entry).
;CYCLES       Not given.
;-------------------------------------------------------------
;CLASS 2      -discreet      *interruptable     *promable
;------       -reentrant     *relocatable       -robust
;=============================================================
;
;...ATARI assignment of storage. Note DATA is any eight
;...consecutive bytes (pp in code field is page number).
LINCNT =     $CD            ;= SUBSET M0
COUNT  =     $CE            ;= SUBSET M1
LINPNT =     $CB            ;= SUBSET M2
DATA   =     lo hi          ;Address of any free eight bytes.
;
;...ATARI BASIC entry. DUMP65 origin at $0610.
ATARIB PLA                  ;For DUMP65 exit to BASIC.      68
       LDA   $58            ;Copy screen start address      A5 58
       STA   LINPNT         ;(low order byte first)         85 CB
       LDA   $59            ;from $0058 & $0059             A5 59
       STA   LNPNT+1        ;to $00CB & $00CC.              85 CC
       LDA   #24            ;Set 24 line count              A9 18
       STA   LINCNT         ;in $00CD.                      85 CD
       JMP   DUMP65         ;Jump to DUMP65.                4C 10 06
;
;=============================================================
;
;...SUBSET assignment of values and pseudo-register storage.
;...Note DATA is in page zero (pp in code field = 00).
WIDTH  =     40             ;Bytes per screen line (dots ÷ 8 ).
LINCNT =     M0             ;Stored number of lines (rows ÷ 8).
COUNT  =     M1             ;Store for 8-byte count.
LINPNT =     M2             ;Stored screen RAM pointer.
DATA   =     M4             ;8-byte store for transposed bit data.
;
DUMP65 LDA   #$1B           ;Send sequence ESC A 8          A9 1B
       JSR   PRNTER         ;to printer to set              20 lo hi
       LDA   #$41           ;line spacing to                A9 41
       JSR   PRNTER         ;8/72".                         20 lo hi
       LDA   #8             ;                               A9 08
       JSR   PRNTER         ;                               20 lo hi
;
DUMP   LDY   #10            ;Count 10 spaces.               A0 0A
CENTRE LDA   #32            ;Send 10 spaces to give a       A9 20
       JSR   PRNTER         ;1" margin to each line         20 lo hi
       DEY                  ;(smaller if printer is in      88
       BNE   CENTRE         ;elite or condensed mode).      D0 F8
;
       LDA   #$1B           ;Send ESC K sequence to set     A9 1B
       JSR   PRNTER         ;normal density bit image       20 lo hi
       LDA   #$4B           ;mode, then the two-byte        A9 4B
       JSR   PRNTER         ;number of bit data (320)       20 lo hi
       LDA   #$40           ;to follow, with low            A9 40
       JSR   PRNTER         ;order byte first.              20 lo hi
       LDA   #1             ;                               A9 01
       JSR   PRNTER         ;                               20 lo hi
       BEQ   LINEST         ;Jump to start, skipping        F0 08
       BNE   LINEST         ;pointer restore.               D0 06
;
NXTBLK PLA                  ;Restore saved pointer to       68
       STA   LINPNT+1       ;first byte on top row          85 M3
       PLA                  ;of each screen line of         68
       STA   LINPNT         ;8 dot rows.                    85 M2
;
LINEST LDA   #8             ;Set count for 8 bytes          A9 08
       STA   COUNT          ;vertical on screen.            85 M1
       LDA   LINPNT         ;Save pointer to first          A5 M2
       PHA                  ;byte on top row of             48
       LDA   LINPNT+1       ;each screen line of            A5 M3
       PHA                  ;8 dot rows.                    48
;
NSHIFT LDA   (LINPNT),Y     ;Set next byte.                 B1 M2
       LDX   #8             ;Index bit data store.          A2 08
;
SHIFT  ROL   A              ;Rotate 8 bits from byte        2A
       ROL   DATA,X         ;into the 8 separate bytes      3E M4 zz
       INX                  ;of bit data store, results     E8
       CPX   #8             ;in a transposition from        E0 08
       BNE   SHIFT          ;horizontal to vertical.        D0 F7
;
       CLC                  ;Prepare to add, no carry.      18
       LDA   LINPNT         ;Add screen byte width to       A5 M2
       ADC   #WIDTH         ;pointer so it addresses        69 28
       STA   LINPNT         ;1st byte of next dot row.      85 M2
       LDA   LINPNT+1       ;(After 8 additions, it         A5 M3
       ADC   #0             ;will address 1st byte of       69 00
       STA   LINPNT+1       ;top row of next line.)         85 M3
;
       DEC   COUNT          ;Repeat for 8 vertically        C6 M1
       BNE   NSHIFT         ;stacked screen bytes.          D0 E2
;
       LDX   #8             ;Then index bit data store      A2 08
SNDBLK LDA   DATA,X         ;and send transposed bit        BD M4 zz
       JSR   PRNTER         ;data to printer.               20 lo hi
       INX                  ;This is one 8 × 8 dot          E8
       CPX   #8             ;matrix.                        E0 08
       BNE   SNDBLK         ;                               D0 F5
;
       INY                  ;Repeat for number of bytes     C8
       CPY   #WIDTH         ;across screen width.           C0 28
       BNE   NXTBLK         ;                               D0 C8
;
       PLA                  ;Discard saved pointer to       68
       PLA                  ;last line of 8 rows.           68
       LDA   #$0D           ;Send carriage-return           A9 0D
       JSR   PRNTER         ;to printer.                    20 lo hi
       DEC   LINCNT         ;Count off one line dumped      C6 M0
       BNE   DUMP           ;and repeat for all lines.      D0 93
       RTS                  ;Then exit, dump done.          60
;=============================================================
```

8086 DUMP

DUMP86 by D Stanford was the only 8086 (8088) routine submitted. It is quite compact at 137 bytes — the machine codes of the 16-bit and 32-bit processors are generally one or two bytes longer than those of 8-bit processors.

This routine is among the very few I received which bothers to reset line spacing to 1/6in. One thing it doesn't do is to ensure that the dump starts with the print head in the left-hand column.

All parameters are programmed into DUMP86, which makes it the least adaptable of the three DUMP routines. The only variability is that the extra segment (ES) can be set to

any 16-byte boundary before entry. Consequently, the routine can be used to dump practically any area of memory and can cope with multi-screen environments.

DATASHEET 3

```
;= DUMP86     Dump bit mapped screen to Epson standard printer.
;
;JOB          To produce a normal-density Bit Image screen dump
;             from a memory mapped screen to an Epson dot matrix
;             printer (or other printer accepting Epson control
;             codes), with a 4/3" left margin (centering a 320
;             dot wide dump on standard 241 mm paper).
;
;ACTION       Address screen 2nd line, 1st dot row, 1st byte.
;             Set 8/72" line spacing.
;             For count of 24 lines:
;             [ Set normal density bit image mode: 480 bit data.
;               Output 60 zero bit images for 4/3" margin.
;               For count of 40 characters per line:
;               [ For temporary store bytes 7 to 0:
;                 [ Address screen one dot row higher.
;                   Copy byte to temporary store. ]
;                 For bit image count of 8:
;                 [ For temporary store bytes 7 to 0:
;                   [ Rotate temporary store byte left 1 bit.
;                     Rotate bit left into accumulator. ]
;                   Output bit image. ]
;                 Address screen 8 dot rows + 1 byte higher. ]
;               Output carriage-return.
;               Address next line, 1st dot row, 1st byte. ]
;             Set 1/6" line spacing.
;
;CPU          8086 (8088)
;HARDWARE     Screen RAM. The screen memory mapping must be such
;             that every bit controls one pixel and each
;             successive row of displayed bytes follows
;             contiguously from the last (no undisplayed
;             margins).
;             Epson standard (FX, MX or RX) printer. Must be set
;             to line-feed automatically on carriage-return.
;SOFTWARE     PRNTER - Epson printer driver, should preserve all
;             register contents. Must be in the same Code Segment
;             as DUMP86.
;
;INPUT        ES = screen segment (actual address of screen RAM
;             first byte divided by 16 - screen RAM must begin on
;             a 16-byte boundary).
;OUTPUT       Flags, AL, BX, CX, DI and TMP changed.
;             All other registers and memory unaltered.
;ERRORS       Single line dump of entire screen will occur unless
;             the printer automatically line-feeds on 0DH code.
;REG USE      F AL BX CX DI ES
;STACK USE    6 + PRNTER stack use.
;RAM USE      TMP - 8 bytes temporary storage (directly addressed
;             as a CS offset).
;LENGTH       129 (plus 8-byte TMP store).
;CYCLES       Not given.
;
;CLASS 2      -discreet      +interruptable     +promable
;-++-+-       -reentrant     +relocatable       -robust

;
TMP     DB    0,0,0,0       ;Storage for 8 bytes read   00 00 00 00
        DB    0,0,0,0       ;from screen RAM.           00 00 00 00
;
DUMP86  MOV   BX,0140H      ;Index 1st byte, 2nd line   BB 40 01
                            ;for width subtraction.
        MOV   AL,1BH        ;Send ESC A 8 sequence      B0 1B
        CALL  PRNTER        ;to printer to set          E8 lo hi
        MOV   AL,41H        ;8/72" line feed.           B0 41
        CALL  PRNTER        ;                           E8 lo hi
        MOV   AL,08H        ;                           B0 08
        CALL  PRNTER        ;                           E8 lo hi
        MOV   CX,0018H      ;Count of 24 lines.         B9 18 00
;
NEWLIN  PUSH  CX            ;Save line count.           51
        MOV   AL,1BH        ;Send ESC K sequence        B0 1B
        CALL  PRNTER        ;to printer to set          E8 lo hi
        MOV   AL,4BH        ;normal density bit         B0 4B
        CALL  PRNTER        ;image mode, then number    E8 lo hi
        MOV   AL,90H        ;of bit image data to       B0 90
        CALL  PRNTER        ;follow (480), sending      E8 lo hi
        MOV   AL,01H        ;low order byte first.      B0 01
        CALL  PRNTER        ;                           E8 lo hi
;
        MOV   AL,00H        ;Clear for margin spaces.   B0 00
        MOV   CX,0050H      ;Count for 80 zero bytes.   B9 50 00
MARGIN  CALL  PRNTER        ;Send 80 zero bytes out to  E8 lo hi
        LOOP  MARGIN        ;effect 4/3" left margin.   E2 F8
;
        MOV   CX,0028H      ;Count of 40 characters.    B9 28 00
NXTCH   PUSH  CX            ;Save character count.      51
        MOV   DI,0007H      ;Index temporary store.     BF 07 00
;
NXTDTA  SUB   BX,0028H      ;Index next dot row.        83 EB 28
        SEG   ES            ;Screen segment override,   26
        MOV   AL,[BX]       ;get screen byte.           8A 07
        SEG   CS            ;Code segment override,     2E
        MOV   [DI+TMP],AL   ;store byte.                88 85 lo hi
        DEC   DI            ;Repeat for 8 vertically    4F
        JNS   NXTDTA        ;stacked screen bytes.      79 F2
;
        MOV   CX,0008H      ;Bit count (8 per byte).    B9 08 00
NXTBIT  MOV   DI,0007H      ;Index temporary store.     BF 07 00
;
NXTBIT  SEG   CS            ;Loop, getting next         2E
        SHL   B,[DI+TMP]    ;single bit from each of    D0 A5 lo hi
        RCR   AL            ;8 stored bytes into AL     D0 D8
        DEC   DI            ;in the correct order,      4F
        JNS   NXTBIT        ;forming transposed data.   79 F6
;
        CALL  PRNTER        ;Send bit data, repeat      E8 lo hi
        LOOP  NXTBIT        ;until 8 bit images sent.   E2 EE
;
        ADD   BX,0141H      ;Index next character.      81 C3 41 01
        POP   CX            ;Restore character count,   59
        LOOP  NXTCH         ;repeat for full line.      E2 D2
;
        MOV   AL,0DH        ;Send carriage-return       B0 0D
        CALL  PRNTER        ;to printer.                E8 lo hi
        ADD   BX,0118H      ;Index next screen line.    81 C3 18 01
        POP   CX            ;Restore line count,        59
        LOOP  NEWLIN        ;repeat for all lines.      E2 A4
;
        MOV   AL,1BH        ;Send ESC A 12 sequence     B0 1B
        CALL  PRNTER        ;to printer to reset        E8 lo hi
        MOV   AL,41H        ;linefeed to 1/6".          B0 41
        CALL  PRNTER        ;                           E8 lo hi
        MOV   AL,0CH        ;                           B0 0C
        CALL  PRNTER        ;                           E8 lo hi
        RET   L             ;Exit (restore CS:PC).      CB
;
```

6502 BIT ROTATION

BITROT from D Heale wasn't submitted in response to the screen dump challenge. The concept, however, fits in neatly with the requirements for converting horizontal bit-images to a vertical format.

The routine rotates an 8-bit by 8-bit matrix stored in eight contiguous pages — zero bytes anticlockwise by 90°. The difference between a transposed matrix and a rotated one (as far as screen dumps are concerned) is the order in which the resultant bytes are output — the rotation must be sent out last byte first.

Fig 1 shows (b) transposed and (c) rotated versions alongside an original matrix (a) for the letter 'F'.

Fig 2 gives a short subroutine for sending out the rotated matrix result of BITROT as bit-image data. You will have to write your own routine to transfer blocks of data to SRC, and call BITROT and SENDRM.

BITROT reminds me of the safety officer who wore three belts and two pairs of braces. It clears all the destination bytes initially, which is an unnecessary operation as they are all going to be shifted out. Each destination bit is then cleared again before the source bit is copied to it in an 8-byte operation which involves saving A on stack — another unnecessary operation as the LSRDST instruction has already accomplished that task.

Despite its shortcomings, BITROT is a useful routine that ought to find a place in anyone's subroutine library.

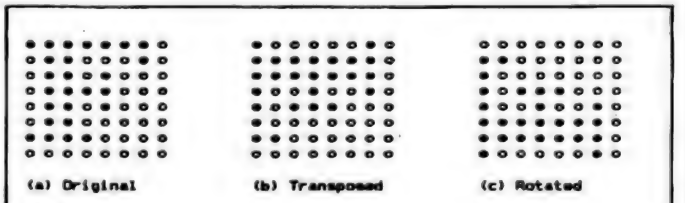

Fig 1

```
;
;...Send rotated 8 x 8 matrix (character) to printer.
SENDRM LDY   #8           ;Index / count DST bytes.     A0 08
SENDLP LDA   SPARE,Y      ;Get next DST byte from end   B9 LF 00
       JSR   PRNTER       ;sent out to printer.         20 lo hi
       DEY                ;Repeat for all eight bytes   88
       BNE   SENDLP       ;of rotated 8 x 8 matrix.     D0 F7
       RTS                ;Then exit.                   60
;
```

Fig 2

DATASHEET 4

```
;=============================================================
;= BITROT     Rotate an 8 × 8 bit matrix.
;=============================================================
;JOB          To rotate an 8 × 8 bit matrix stored as eight
;             contiguous bytes in page zero by 90 degrees,
;             storing the result similarly.
;ACTION       Clear destination area.
;             For count of 8:
;             [ For each source byte (7 to 0):
;               [ Shift destination byte 8 right by 1 bit.
;                 Copy most significant bit (msb)
;                 from current source byte
;                 to destination byte 0. ]
;               For each source byte (7 to 0):
;               [ Rotate current source byte left by 1 bit. ]
;               Rotate destination area upwards by 1 byte. ]
;-------------------------------------------------------------
;CPU          6502
;HARDWARE     None.
;SOFTWARE     None.
;-------------------------------------------------------------
;INPUT        8-byte source matrix in M8 to MF.
;OUTPUT       8-byte result matrix in M0 to M7.
;             P, A, X, Y, M8 to MF and one page zero byte
;             immediately below M8 (designated 'LF') are changed.
;ERRORS       Indexing error if either source or destination page
;             zero blocks 'wraparound' zero page memory.
;REG USE      P A X Y
;STACK USE    1
;RAM USE      'LF', M8 to MF
;LENGTH       69
;CYCLES       Not given.
;-------------------------------------------------------------
;CLASS 2      -discreet      +interruptable     +procable
;-++-+-       -reentrant     +relocatable       -robust
;=============================================================
;
SPARE  =  LF          ;Store for rotated destination byte.
DST    =  M8          ;8-byte store for rotated matrix.
SRC    =  M8          ;8-byte stored source matrix.
;
```

```
BITROT LDA  #0        ;Clear for clearing DST.          A9 00
       LDY  #0        ;Index / count 8-byte DST.        A0 00
CLRDST STA  SPARE,Y   ;Clear 8-byte destination         99 LF 00
       DEY            ;page zero for rotated            88
       BNE  CLRDST    ;result.                          D0 FA
;
       LDX  #8        ;Count for 8 DST bytes.           A2 08
OUTLP  LDY  #0        ;Index / count SRC bytes.         A0 00
;
INLP   LSR  DST       ;Clear for next SRC bit.          46 M8
       LDA  SRC-1,Y   ;Get next source byte and         B9 M7 00
       AND  #$80      ;select only next bit.            29 80
       PHA            ;Save next bit while              48
       LDA  DST       ;re-clearing msb of DST           A5 M8
       AND  #$7F      ;byte ready for next SRC          29 7F
       STA  DST       ;bit.                             85 M8
       PLA            ;Restore next SRC bit and         68
       ORA  DST       ;merge with DST byte,             05 M8
       STA  DST       ;store back to DST.               85 M8
       DEY            ;Repeat for single bit from       88
       BNE  INLOOP    ;each of 8 SRC bytes.             D0 EA
;
       DEX            ;Count DST byte completed         CA
       BEQ  BREND     ;and exit if all done.            F0 1D
;
       LDY  #8        ;Index / count SRC bytes.         A0 08
ROTSRC LDA  SRC-1,Y   ;Shift all source bytes           B9 M7 00
       ROL  A         ;up by 1 bit, bringing            2A
       STA  SRC-1,Y   ;next bit of each into            99 M7 00
       DEY            ;the msb ready for transfer       88
       BNE  ROTSRC    ;to destination byte.             D0 F6
;
       LDA  DST+7     ;Move last DST byte to            A5 M7
       STA  SPARE     ;SPARE for DST rotation.          85 LF
       LDY  #8        ;Index / count DST bytes.         A0 08
ROTDST LDA  SPARE-1,Y ;Shift all DST bytes up           B9 LE 00
       STA  SPARE,Y   ;higher in memory by one          99 LF 00
       DEY            ;byte, bringing next DST          88
       BNE  ROTDST    ;byte ready for SRC bits.         D0 F7
;
       BEQ  OUTLP     ;Go get next result byte.         F0 C8
;
BREND  RTS            ;Exit, matrix rotated.            60
;
```

END

Connection confusion

Peter Tootill and Steve Withers look at a proposed standard for cheaper interfacing.

One of the main problems with the RS232 or V24 standard is the connector. The normal one is the 25-way D type, which is expensive and bulky. Several modem and computer manufacturers have now started to use DIN connectors, but there is no real standardisation.

The UK Government's Public Services Working Party and its Central Computer and Telecommunications Agency have now taken on this standardisation. Indeed, they have gone further by proposing to abandon the archaic voltage levels of the RS232 standard (+3 to +24 volts for logic 0, or on, −3 to −24 volts for logic 1, or off). With modern ICs used in micros, especially portable micros working on a five-volt supply, these levels are very difficult to provide.

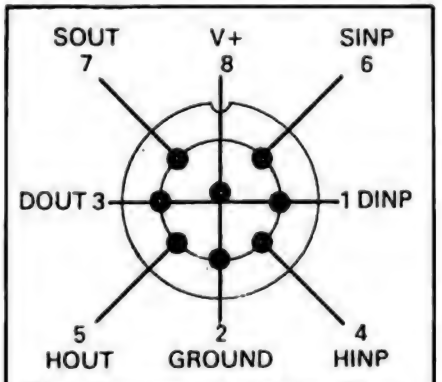

Fig 1 Proposed pin connections

The new standard (called S5/8, for serial five-volt, eight-pin) proposes an eight-pin DIN connector (Fig 1), and uses HCMOS voltage levels (that is, approximately +5 volts for on and zero volts for off). The advantage of the eight-pin connector is that the socket will accept three, five and seven-pin plugs as well as eight in applications where only some of the signals are required. The actual signals proposed, together with their pins and also the approximate RS232 equivalents, are listed in Fig 2.

Pin no	S5/8 name	Description	RS232/V24 equivalent name/description
1	DINP	Data input	Transmit data (TD)
2	Ground		Signal ground
3	DOUT	Data output	Receive data (RD)
4	HINP	Handshake inp	Data terminal ready (DTR)
5	HOUT	Handshake out	Clear to send (CTS)
6	SINP	Status inp	Ready to send (RTS)
7	SOUT	Status out	Data set ready (DSR)
8	V+	+5 volt source	N/A

Fig 2 Proposed signals and RS232/V24 equivalents

Connector leads using five-pin DIN plugs will be suitable for most applications, and these are widely available for about $5.

The only shortcoming of this standard is that it is light on control signals. If a computer is connected to an auto-answer modem that can handle two different baud rates, you will need at least two if not three control lines from the modem to the computer. These would be carrier detect, speed select and perhaps ring indicator if CCITT 108/1 working is used. (This is where the modem tells the computer that the phone is ringing, and lets the computer decide whether to answer or not. This method can be used for systems which are running at certain times or using the ring-back method). In addition, a status signal informing the computer that the modem is ready for action is required. No doubt these problems can be overcome, but again there needs to be standardisation or we'll be worse off than we are now.

It is proposed that the standard would replace the Centronics interface for printers, too. A cheap adaptor (costing no more than the normal Centronics printer cable) would be able to convert the signals from your micro to the printer. It

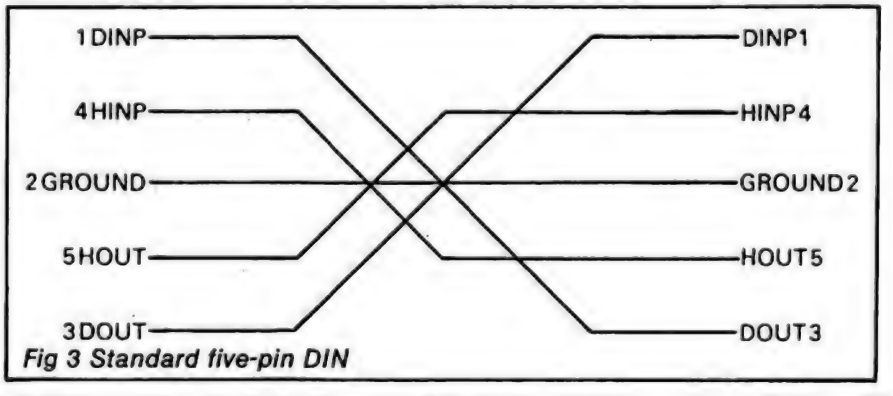

Fig 3 Standard five-pin DIN

would be powered by the five-volt line available on pin eight of the connector.

The standard has already been adopted by one manufacturer in the UK, and will be submitted to the British Standards Institute for adoption as a British Standard. Of course, this is an industry in which real standards are set in the marketplace, but the existence of an "official" specification can make a good idea attractive to a wider range of manufacturers.

Microtex 666

Microtex 666 continues to grow. Last month we observed that only Commodore 64 users were being catered for (so far as the telesoftware collection was concerned), but now IBM PC programs have started to appear. Those of you who haven't joined Microtex 666 but do have videotex software might like to know that a small subset of the programs for these machines is available as a "free sample".

The majority of the IBM software falls into the "utility" category — like a keyboard redefinition program — but there are also some items that are just for fun, along with a high-precision calculator.

Trading Post now contains a remarkable range of small ads, from games cartridges through tenpin bowling balls to sailing boats. We understand the original plan was to stick to computer-related items, but the response was much broader than expected.

At the time of writing the "Questions and Answers" and "Magazine Index" sections were being rebuilt, but they should be ready long before this issue reaches the newsagents' shelves. The Technical Information area has been expanded to include a listing of bulletin boards — including some we hadn't heard of!

The response of Microtex 666 subscribers to Gametalk has been very good, with many game reviews being submitted to add to those taken from *Personal Computer Games*. Gametalk is also the place to go for hints and tips on the games that have you baffled.

System News

There's lots of news this month, including a couple of "firsts".

Luke Groeneveld operates what we believe to be the only non-commercial videotex system in Australia. Videotex/4000 is only available between 12 noon and 11pm on Saturdays and Sundays, but Luke plans longer hours (and possibly extra phone lines) as demand increases.

The system provides the usual videotex features, although some (such as telesoftware) are potential rather than actual. Although visitor access is allowed, many facilities are available only to registered uses, and in any case visitors are restricted to 15 minute sessions.

Computer clubs are being given the opportunity to have their own sections within the database. Interested groups should contact Luke through Videotex/4000, or Viatel Mailbox 496962370.

Videotex/4000 is on (049) 69 6237 but remember, Saturdays and Sundays, 10am-11pm ONLY. Of course, you need a videotex terminal or emulator and a 1200/75 baud modem.

A company called Resource Data Pty Ltd has set up two novel dial-up services. No charges are levied for these systems, as they are financed by advertising. BERT provides news from the world of business and economics (the name is an acronym for Business and Economic Reporting Terminal), while DUNCAN (Dial Up News and Computer Advertising Network) provides computer related news items.

Another unusual feature is that these systems allow no interaction. Once you are connected, just sit back and watch the pages roll by. Don't worry though, you would be an exceptionally slow reader if you couldn't keep up.

If you have videotex equipment, BERT can be accessed on (03) 67 7371 and (02) 211 0855; users of ordinary terminals (300 baud) should dial (03) 602 1522. The only number we have for DUNCAN is (03) 602 5200 (300 baud). If you use the 300 baud lines the appropriate settings are seven data bits with even parity, but you are likely to find that eight bits/no parity will also work. Both systems are available 24 hours per day, seven days per week.

Still in Melbourne, the purpose of the AM-NET Multi-User TurboDOS system is to facilitate the exchange of public domain software and information between users of CP/M, Unix, MS-DOS, and amateur radio. Visitors can read bulletins, but membership is needed to leave messages and up or down load software. At $5 a year, it's one of the cheapest subscriptions we've seen.

In line with the interest in amateur radio, one of system operator Peter Hallgarten's longer-term plans involves the addition of a packet radio link.

Bill Boulton's Software Tools RCP/M is the first system we have heard of switching exclusively to V22 (1200 bps) communications. As V22 modems become affordable other systems are likely to follow suit. In future our listings will highlight V22 and V23 systems.

Last month the guys at RUNX sent us some information about the system, but the editor hi-jacked it and used it in Newsprint. Still, at least we've got the 1200 and 1200/75 baud lines in the listings now.

C64 BBSs keep crawling out of the woodwork! In Sydney, Graham Lee runs Commboard, aided and abetted by "Samurai" and "Mr Footy". The intended audience is "serious C-64 users", but Graham accepts that the magazine section and some of the bulletin boards are of wider interest. Yes, there are multiple bulletin boards, half a dozen of them, for such diverse groups as teachers, BBS system operators, and house-hunters. There's a C64 board of course, along with a large quantity of downloadable software.

As is increasingly common, most facilities are restricted to paid-up members. The subscription is $25 per year, and you can contact Graham C/- 199 Coogee Bay Road, Coogee, 2034. He's also selling copies of the BBS software for $180 (on any disk format).

Down in Bendigo, we have the MIN-NET BBS. It sounds like Mal Fields is using the same software as Graham — the features are very similar. We like the way Mal explains the reason for charging a subscription: "MIN-NET BBS is intended to be frequented by those who will look on it more as a club than a pub". Visitors are still welcome, so it would be worth taking a look. The number is (054) 41 3013, and the system is permanently on-line.

We have received partial information about a number of systems. If anyone recognises any of the names and can confirm that the boards exist, we would be grateful for further details. We're particularly concerned about getting the phone numbers and hours right.

NSW: Scorpio, Bresike Omen, Skull ABBS, Zeta RTRS, Omen VI.
ACT: DSA-80 RTRS.
QLD: Tomorrowland RMSD, Bex RCPM.
WA: Perth RMPM, Computext.
TAS: MS-RBBS, Launceston RBBS
NZ: Rotorua.

You will see other new systems in the list below, some with incomplete information — if you can fill in the gaps, please contact us (addresses at the end of the listings).

One last thing — it's been pointed out that there are a lot of newcomers to this aspect of computing, and that they might appreciate a brief summary of the information we tend to assume our readers know. Fair enough! Unless otherwise stated, all systems are 300 baud full

An apology.

We would like to apologise to anybody who has already bought a communications package for their Commodore 64.

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duplex, and use eight data bits and no parity. If you can't see what you are typing (but you can see the text that the BBS is sending to you), set your terminal software to 'local echo'. On the other hand, if your typing looks lliikkee tthhiiss, you should turn the local echo off. The combination of eight data bits and no parity nearly always works. If it doesn't try seven data bits with even parity.

As a matter of courtesy, make your first call to a bulletin board at a reasonable hour, and *always* dial carefully. It's not unknown for incorrect numbers to be disseminated, either as a result of simple error or because the information has become outdated (eg the operator moved house). We are not completely blameless in this respect, but we rely on you to keep our listings up to date. If you find a mistake, *please tell us* — the address is at the end of this article.

Bulletin Boards

Each entry shows the available information in this order: name, phone number, access control ("P" for public access and "M" for member, possibly with a "V" for visitor access), operator's name, operating times, and any special notes (including modem type if not V21 (300 baud).

Systems outside Australasia are only listed if we have been informed that they are available to the public 24 hours per day.

Australian Systems

Micro Design Lab RCPM. (02) 663 0150. P. Stephen Jolly. 5pm-7am weekdays, 24 hours weekends.

MI Computer Club BBS. (02) 662 1686. MV Evan McHugh. 24 hours daily. Program downloading.

Sydney Public Access RCPM. (02) 808 3536. MV. Barrie Hall and David Simpson. 24 hours daily.

Prophet RBBS. (02) 628 7030. P. Larry Lewis. 24 hours daily.

TISHUG BBS. (02) 560 0926. MV. Shane Anderson. 7pm-7am weekdays, 24 hours weekends.

AUGABBS. (02) 451 6575. MV. Mathew Barnes and Andrew Riley. 24 hours daily.

AUSBOARD. (02) 95 5377. P. Daniel Moran. 24 hours daily.

Club-80 RTRS. (02) 332 2494. MV. Michael Cooper. 24 hours daily.

Omen I. (02) 498 2495. P. Ted Romer. 4.30pm-9am weekdays, 24 hours weekends.

Oracle. Has temporarily closed down. Previous number printed in Network News should be ignored.

Infocentre. (02) 344 9511. MV. 24 hours daily.

Dick Smith Electronics RIBM. (02) 887 2276. P. Ian Lindquist. 24 hours daily. Program downloading.

Sorcerer Users Group RCPM. (02) 387 4439. MV. John Woolner. 6pm-8am weekdays, 24 hours weekends. Ring-back system.

Date BBS (02) 550 1004. MV. Steven Williams. 9am-11pm weekdays, 24 hours weekends. Computer dating.

Keeboard TBBS. (02) 631 3282. P. Philip Keegan. 6pm-8.30am daily.

RUNX Unix System (02) 487 2533. MV. Mark Webster. 24 hours daily. Call (02) 48 3831 for system status. Also on (02) 48 3831 (V22) and (02) 487 1860 (V23).

Tesseract RCPM. (02) 651 1404. MV. John Hastwell-Batten. 24 hours daily.

Tomorrowland's DIRECT. (02) 411 2053. NV. Mike Kidson. 24 hours daily. Helpline: (02) 412 3909.

RCOM BBS. (02) 667 1930. MV. Simon Finch. 24 hours daily. For Commodore 64 users, software downloading to registered users only $20/year to Box 1542, GPO, Sydney 2001. Half duplex.

BERT. (02) 211 0855. P. Resource Data. 24 hours daily. V23 videotex.

Commboard. (02) 664 2334. MV. Graham Lee. 24 hours daily. For Commodore 64 users, membership $25/year to 199 Coogee Bay Road, Coogee 2034.

Newcastle Microcomputer Club RCPM RBBS. (049) 68 5383. MV. Tony Nicholson. 5pm-8.30am weekdays, 24 hours weekends. RBBS free to all, RCPM for members only — $4/year to PO Box 293, Hamilton, NSW 2303.

Canberra RBBS. (062) 88 8318. 24 hours daily.

Canberra IBBS (062) 58 1406. 24 hours daily.

MICOM RCPM CBBS. (03) 762 5088. MV. Peter Jetson. 24 hours daily.

Melbourne PIE. (03) 878 6847. P. Len Gould. 24 hours daily.

Sorcerer Computer Users Association CBBS. (03) 434 3529. MV. David Woodberry. 24 hours daily. Program downloading for members.

PC Connection IBBS. (03) 528 3750. Lloyd Borrett. 24 hours daily. IBM PC program downloading.

Omen IV. (03) 846 4034. Philip Westh. 24 hours daily.

Hisoft IBBS. (03) 799 2001. Richard Tolhurst. 24 hours daily. IBM PC program downloading.

Computers Galore IBBM. (03) 561 8497. Bob Cooban and Martin Scerri. 24 hours daily. IBM PC program downloading.

East Ringwood RCPM. (03) 870 4623. Mick Stock. 4pm-midnight. Monday-Friday ONLY.

C64-BBS. (03) 489 4557. MV. Alan Miles. 24 hours daily. Commodore 64 software up/downloading.

Microbee RBBS. (03) 873 5734. G. Forrest. 24 hours daily.

MicroPro BBS. (03) 568 8180. MV.

AM-NET. (03) 366 7055. MV. Peter Hallgarten. 24 hours daily. Membership $5/year.

Gippsland RCPM. Off-line at present, old number is now private.

Mail-Bus. (051) 27 7245. M. Max Moore. 24 hours.Membership virtually essential. Write to PO Box 234, Newborough, Vic 3825.

MIN-NET. (054) 41 3013. MV. Mal Fields. 24 hours daily. Enquiries to (054) 43 2589 during business hours ONLY.

Software Tools RCPM. (07) 378 9530. Bill Bolton. 24 hours daily. CP/M, MS-DOS, Unix program downloading. V22 (1200 baud) only.

BEX II RCPM. (07) 395 1809. 24 hours daily.

Tomorrowland. (07) 286 2438. 24 hours daily.

BCUG. (07) 808 2125. 24 hours daily. Commodore users' group.

ACEA. (07) 341 0285. 24 hours daily. Commodore.

Brisbane Microbee RCPM. (07) 51 3582. 6pm-8am weekdays, 24 hours weekends.

Competron IBBS. (07) 52 9294. 24 hours daily.

HiTech C BBS. (07) 38 6872. 24 hours daily.

TI-BBS. (07) 263 6161. 7pm-6am weekdays only.

CAD-IBBS. (070) 51 3582. 6pm-8am weekdays, 24 hours weekends.

COCO-LINE. (075) 32 6340. 24 hours daily. Tandy Color Computer.

Adelaide Micro Users Group BBS. (08) 271 2043. MV. 9am-9pm week-

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I-256	IBM RAM CARD 256K	414.00	473.00
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I-384	IBM RAM CARD 384K	481.00	550.00
I-448	IBM RAM CARD 448K	515.00	588.00
I-512	IBM RAM CARD 512K	548.00	627.00
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I-S192	IBM 192K RAM ' ' '	465.00	532.00
I-S256	IBM 256K RAM ' ' '	499.00	570.00
I-M064	IBM 64K RAM SERIAL PORT	495.00	566.00
I-M128	IBM 128K RAM PARALLEL PORT	529.00	604.00
I-M192	IBM 192K RAM CLOCK WITH	562.00	643.00
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I-M384	IBM 384K RAM ' ' '	663.00	758.00
I-M512	IBM 512K RAM ' ' '	730.00	835.00
W-128	WANG RAM CARD 128K	699.00	799.00
W-256	WANG RAM CARD 256K	763.00	872.00
W-384	WANG RAM CARD 384K	937.00	1071.00
W-512	WANG RAM CARD 512K	1006.00	1150.00
W-1024	WANG RAM CARD 1024K	1250.00	1429.00
W-1536	WANG RAM CARD 1536K	1499.00	1714.00
W-2048	WANG RAM CARD 2048K	1749.00	1999.00
H-256	HP150 RAM CARD 256K	750.00	900.00
H-384	HP150 RAM CARD 384K	1050.00	1260.00
H-M256	HP150 RAM CARD 256K HP-IL &	1150.00	1380.00
H-M384	HP150 RAM CARD 384K PARALLEL	1550.00	1860.00

days, 10am-10pm weekends and public holidays.

Computer Ventures CBBS. (08) 255 9146. Daniel Schumacher. 24 hours daily. NB: This number has been misprinted in recent issues — please ensure your own records are correct.

The Electronic Oracle. (08) 260 6686. MV. Don Crago and Grayham Smith. 24 hours daily. Program downloading. Membership $35/year to 12 Brentwood Road, Flinders Park, SA 5025.

Multiple BBS. (08) 255 5116. 24 hours daily.

Nexus. (08) 243 2477. 24 hours daily.

SAC64. (08) 382 4631. 24 hours daily. Commodore users' group.

Red Centre RCPM. (089) 52 8852. 24 hours daily.

Omen II. (089) 27 4454. Terry O'Brien. 24 hours daily.

Outback RCPM. (089) 27 7111. Phil Sampson. 24 hours daily.

Omen III. (09) 279 8555. Greg Watkins. 24 hours daily.

New Zealand systems

NZ Micro Club RBBS. 0011 64 9 762 309. Chris Cotton. 24 hours daily.

Software up/downloading. Type "help" to log in.

Attache RBBS. 0011 64 9 78 9084. 24 hours daily.

These listings are believed to be correct, but we welcome new information. Please mention whether you have first-hand knowledge of the systems you tell us about, or are simply passing on the information. Viatel users can send messages to Mailbox 063000030, users of RUNX and other systems on ACSnet can mail to stephenw@murdu, and letters may be sent to Steve Withers, C/- *Computer Publications*, 77 Glenhuntly Road, Elwood, Victoria 3184. END

Overseas systems

SYSTEM	NUMBER	NOTES
North America		
SPACE Citadel	0011 1 206 839 4759	
Ckcms Citadel	0011 1 206 329 0436	
Eskimo North Minibin	0011 1 206 527 7638	
Conn-80	0011 1 212 441 3755	TRS-80 Color Computer
CLEO	0011 1 213 618 8800	Job vacancies
Mindstorm Network	0011 1 812 235 0908	Networked BBSs
Europe		
ELFA ABC-MONITOR, Sweden	0011 468 730 0706	Half Duplex
ABC-Banken, Sweden	0011 463 511 0771	
ABC-MONITOR, Sweden	0011 468 801 523	Password required
CBBSD Gothenburg	0011 463 129 2160	75/1200 baud
CBBS Sweden*	0011 463 169 0754	
BUG, Sweden	0011 468 463 528	BBC Micro
XD-BBS Helsinki	0011 358 072 2272	
Commodore BBS, Finland	0011 358 116 223	
Tedas, Munich	0011 49 89 596 422	
Decatex, Germany	0011 49 66 154 51433	
UK		
BABBS Felixtowe	0011 44 394 276306	Apple Users' Group
BABBS TWO Basildon	0011 44 268 778956	Apple Users' Group
Blandford Board	0011 44 258 54494	
CABB	0011 44 631 3076	300/300 and 1200/75 baud
CBBS South West	0011 44 392 53116	
CBBS Surrey	0011 44 4862 25174	
Clinical Notes Online	0011 44 524 60399	
Computers Incorporated Newcastle	0011 44 207 543555	
Fido Compulink	0011 44 6286 63571	
Liverpool Mailbox	0011 44 51 428 8924	
Manchester Open BBS	0011 44 61 736 8449	300/300 and 1200/75 baud
Microweb TBBS	0011 44 61 456 4157	BBC Micro
NBBS Birmingham	0011 44 827 288810	
Africa		
Connection 80, Cape Town	0011 27 21 457 750	
TRShop, Cape Town	0011 27 21 5367	
Peters Computers, Johannesburg	0011 27 11 834 5134	

* After receiving the tone and connecting your modem, either type <C/R> or <COM C/R>. The system then asks for a password which is 'cbbs' in *lower*-case letters. If you only get a '>' from the system, it needs resetting, so type <I> C/R.

Threaded operation

Paul Dourish describes the principles involved in creating a threaded interpretative language (TIL) compiler, using Forth as his example language.

We have all seen pictures of the early computers; giant machines such as ENIAC which filled entire rooms with boards full of hot valves, and did calculations three times in case a valve blew half-way through. The progress made from those machines to the modern micro is easy to see. Perhaps not quite so obvious are the advances made in software, and especially in the field of programming languages.

In the early days, programs were 'hard-wired'; to change the program involved physically rewiring the computer. Later, machine code programs were keyed into the computer in binary, using switches on the front panel. Pure machine code was used as it is very machine efficient, and in those days machine time was much more expensive than human time. High-level languages were introduced, with Fortran designed by an IBM team under the leadership of John Bachus, while at about the same time, Algol was designed as a theoretical language but not implemented.

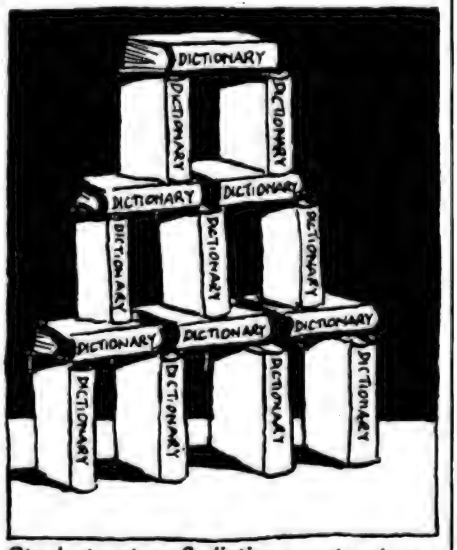
As other languages were developed, they all had their own particular features but generally followed the same pattern. These are the Algol-derived languages and are with us today in such languages as Pascal. However, at various stages, there have been programmers, dissatisfied with the state of language design, who have designed new languages with often quite fundamental changes. One departure from the standard line of programming language is Forth, designed by Charles Moore. Forth is radically different from its peers and achieves its efficiency in memory consumption, ease of use and execution speed through being a threaded interpretative language.

Forth

The main principles of Forth, which is the best example of a threaded interpretative language (TIL) and the one with which most people are familiar, are fairly well-known, and have been covered in introductory articles in this magazine and others. Although the main purpose of this article is to show the techniques involved in building a TIL compiler, a brief outline of Forth is necessary as an introduction.

When you are supplied with your language, it really only consists of simple instructions performed by machine code routines called 'primitives', and a little code to do the compiling. Then, you build up these routines: you write your own programs and functions (in TILs, these are called 'words') to perform slightly more complicated operations, but you define these in terms of the simpler words. When defined, new words can be included in more complicated definitions, so you bridge the gap between the simple operations and the complex ones the computer is to perform.

Words which you have defined are called 'secondaries' to distinguish them from the primitives or 'primaries'. It is vaguely like defining a subroutine in Basic, or a procedure in BBC Basic. The main difference is that the TIL now regards your word as being equally as important as any of the primitives, as it cannot tell the difference between them. The other important thing you must learn about the way Forth works is the 'stack'. Where other languages use variables to store values, Forth uses the stack. You may have come across a stack before in assembly language, but for those who have not, here is a brief representation.



Stack structure & dictionary structure

The stack is a 'data structure'. It is a way of collecting many pieces of data and imposing a format upon them so that they always behave in the same way, and can, at times, be regarded as a single unit, like an array. We usually classify data structures by the order in which their elements are processed. For example, in an array, an element can be put in any position at any time: that is, you can jump straight in at the twentieth element, or at the thirty-first, or whatever.

With a stack, however, there is a definite order in which the elements are processed, read and written; the rule governing this is 'First In, Last Out' (usually shortened to FILO). Imagine a stack of books — you put each one down on top of the last, so that when you take them away again the first one you pick up is the last you put down. This is the way a data stack works (except, of course, that it uses numbers rather than books). We call the operation of putting a number onto the stack 'pushing' the number. The inverse operation, taking a number from the stack, is called 'pulling' the number, or 'popping' it from the stack. In Forth, we use the operator . (dot) to pop the stack. Using . (and pressing RETURN, of course) will cause Forth to take the number off the top of the stack and print it on the screen.

The stack forms the basis of all Forth arithmetic, which uses a format called Reverse Polish Notation. The numbers to be operated on are entered before the operator, and are pushed onto the stack. The operator then takes the values off the stack, uses them, and pushes the answer back onto the stack. This means that 3+4 must be written as 3 4 +, and 6*10+5 as 6 10 * 5 +. After, say, 4 3 +, the number 7 is on the top of the stack.

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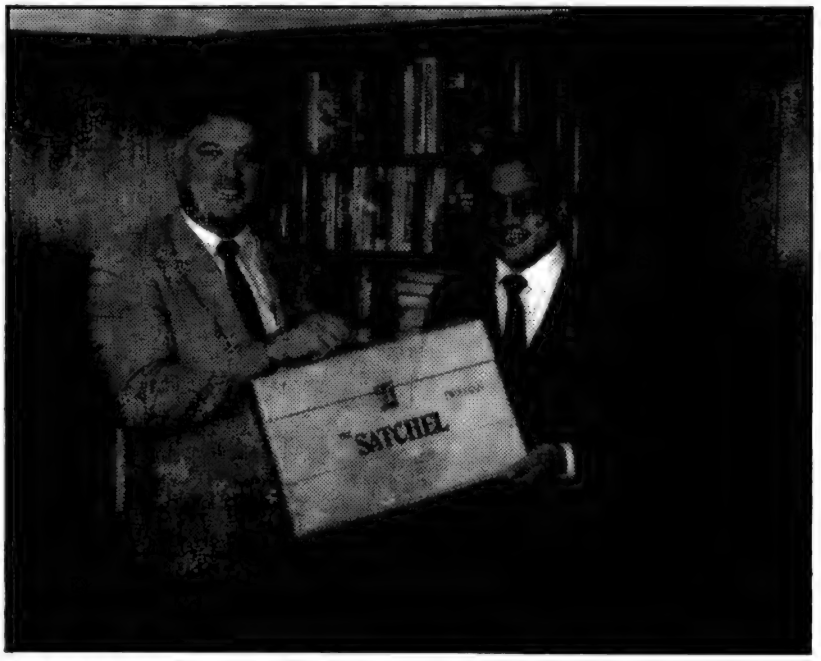

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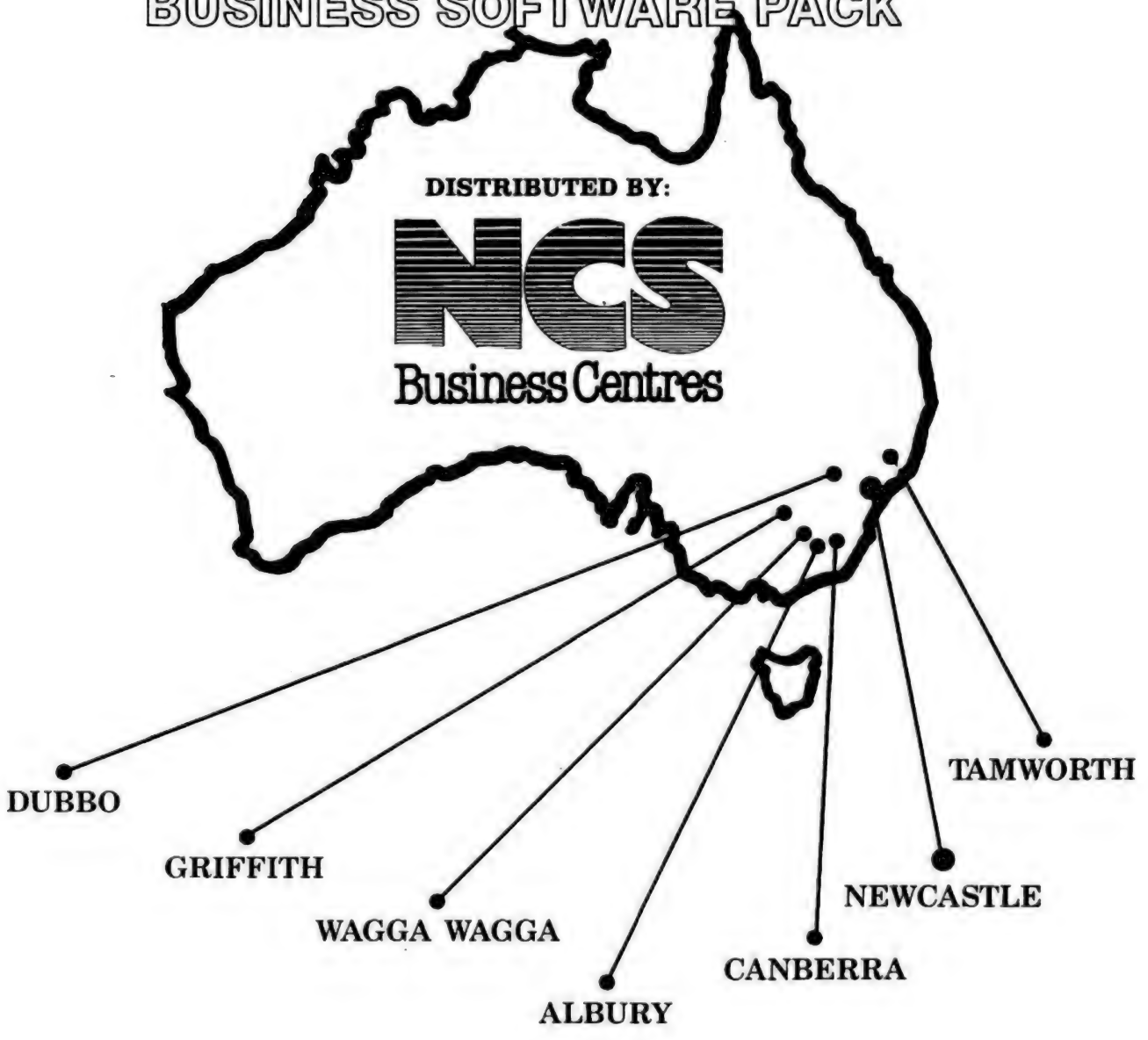

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A TIL in use

How does a TIL work? We have already seen that the TIL program itself is really only a lot of small machine code routines that perform very simple operations, such as putting numbers onto the stack, doing arithmetic, and manipulating the stack in various ways. When you type a line of code into your TIL, it scans it from left to right looking for instructions. Whenever it finds a number, it pushes that number onto the stack. Otherwise, it deduces that, if the symbols it reads do not constitute a number, then they must be a word, either a primitive or a secondary. To check this, it looks up a table called the 'dictionary'.

The dictionary contains the names of all the words which have been defined either by you or by the system, and for each it gives an indication of where the machine code is to be found so that the TIL can execute the instruction. The exact nature of the data held in a single dictionary entry depends both on the type of word defined (primitive or secondary), and on the implementation of the TIL. The beginning of the entry almost invariably holds all or part of the name of the word, and, if only part is held, then an indication of how many characters there are in the word name. However, most of the differences in dictionary entries occur in the second section, which deals with where the machine code to execute the words is stored. More detailed examinations will let us judge the relative merits of the various approaches.

Usually, the section of the dictionary entry that deals with the location of primitive code in memory contains that code itself, so that it can be directly executed. However, there are four ways of storing the same information for a secondary, and these are called direct-threaded, indirect-threaded, token-threaded and subroutine-threaded. For the purposes of this article, the first three can all be classed simply as pointer-threaded, as the only major difference in philosophy is between the first three and the fourth.

Pointer-threaded code

In pointer-threaded code, the information held in the dictionary entry consists of a series of pointers to the executable code. In other words, it contains a list of the start addresses of the routines to do each of the individual words that go to make up this word as a whole. Therefore, if we have defined a word MYWORD in terms of three primitives, PRIM1, PRIM2 and PRIM3, then the pointer-threaded code for MYWORD in the dictionary is a list of the addresses of the executable machine code for PRIM1, PRIM2 and PRIM3. This means that when we come to run the program (that is, to execute the word) we must call another program, generally called the 'inner interpreter', which will read each address, jump to that address, execute the code it finds there, and return to the address list ready to read the next address.

Subroutine-threaded code, on the other hand, takes advantage of the fact that the processor already has the ability to jump to a given address and return to the address from which it jumped, with its 'Jump to Subroutine' code (JSR in 6502 assembly language and CALL in Z80). Instead of giving just the list of addresses, subroutine-threaded code stores a JSR opcode in front of each address, effectively making each address into an instruction to jump to the subroutine at that address. For our MYWORD example, the compiler produces something akin to:

```
JSR PRIM1
JSR PRIM2
JSR PRIM3
RTS
```

Instead of having to write an inner interpreter to decode the address list, the TIL compiler designer need merely cause his program to jump to the first instruction of the code stored in the dictionary to execute the secondary. It is interesting to note that if, as previously suggested, the machine code for the primitives is stored inside the dictionary, then the TIL is behaving in the same way for both primitive and secondary words, which is more elegant than having to call an extra subroutine to run some words but not others.

The advantage of pointer threading is that, as there is no need to store JSR instructions throughout the definitions, it will take up less space. The advantages of subroutine threading are that it is faster (as the processor can interpret the code faster by itself than the inner interpreter could), it does not necessitate the design of an inner interpreter, and it is easier to implement. There is a compromise to be made, but it seems that, for a first compiler, subroutine threading has the edge.

Writing a TIL compiler

The task is so simple that it is practical to write the compiler completely in assembly language, without any recourse to the high-level languages normally used to write compilers for more complicated languages. There is a simple series of steps to follow to design a working TIL compiler, suitable for use on a micro. These are:

(i) Design of the language selected for compiling. For example, what will the primitives be? How will they fit together?

(ii) Design of stack structure and dictionary structure. These two data structures will affect every detail of your compiler, so do not skimp on their design. You must strike a balance between having enough space in the structure to implement all the features you want, and having enough space left

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over for the rest of the compiler, and to do something useful with the language when it is running.
(iii) Writing the basic primitives. These will be for stack manipulation, arithmetic operations, and the decoding of numbers from characters to integers. This will depend on how wide you have decided to make your stack. Do not forget negative numbers — are you going to allow them? How can you handle them?
(iv) Testing the basic primitives. I have included testing as a separate section as it is so important, and so often overlooked or hurried. You must test each individual word thoroughly, plus combinations of words, to see how they interact. Above all, you will have to adopt a methodical approach to the testing, otherwise you will be in no state to correct an error when (not 'if' — there *will* be errors!) you find one.
(v) Writing the next level of primitives. These will be the more complicated routines, for example those handling looping, jumping and branching. Their implementation will be more complicated than those of the others, and they will require considerably more thought.
(vi) Testing the next level. This is even more important than testing the other routines, as testing these is far more difficult. It is trivial to spot that a routine which claims that 2+2=37 could do with some adjustment, but the errors involved with looping are very different and fall into two groups: those that are very subtle so you don't notice them until it's too late; and those which jump off into the memory and completely crash your system.

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Make sure that you keep back-ups. I can tell you from bitter experience that losing a day's or a week's work is extremely annoying.
(vii) Writing the parser. This is the section of the program that is, you hope, going to take your source program, produce suitable object code, and place it correctly in the dictionary. This is very tricky and can cause spectacular errors due to the number of stages at which you can go wrong. However, you should survive if you remember *exactly* what you have to do, and break it down into subsections. Code and test each subsection independently (for example, you would have one subsection to create space for a new dictionary entry, and another to find the address of the code of a previously-defined name). Don't neglect the error conditions, such as undefined words in the input.
(viii) Testing the parser.
(ix) Merging the parser with the primitives. Assuming you have been logical and consistent in your approach and

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haven't done anything silly such as changing your dictionary structure mid-way, then everything should be alright. However, the fact that everything should work in theory does not relieve you of the burden of...

(x) Run-testing the entire system.

You can now write the compiler (don't let the apparently huge volume of work daunt you), and you will require more detailed information about the sections I have just outlined. Any examples given from now on come from my own compiler, which was written for Forth on the BBC Micro (6502 assembly language), but the algorithms and methods given are applicable to any TIL or language.

The first step is to choose the language you want to compile, and in this case I chose Forth. The version I implemented is a subset of the Forth-79 standard; as the object of the exercise was merely to see if I could write a TIL compiler at all, the actual language itself was relatively unimportant, so there was no need to take special pains to ensure a complete Forth-79 implementation.

The second step is the choice of a suitable structure for the stack and the dictionary. The first version of the compiler I wrote used a stack of eight-bit unsigned integers (that is, in the range 0 to 255). This is obviously the easiest stack to implement on an eight-bit machine, both from the point of view of the stack manipulation itself, as well as from that of the arithmetic routines. However, this really was not terribly useful for doing anything practical, so I updated it to run with a stack of 16-bit, signed integers which have the range −32768 up to 32767. This step is more difficult than it sounds, but it means I can now store addresses on the stack, which is important for the implementation of Forth variables. Two bytes of zero page storage were also laid aside as the stack pointer: that is, these two bytes hold the address of the top item on the stack.

'Run-testing the entire system'

It is far more difficult, however, to decide upon a suitable dictionary structure. I stored the entire name of the word, rather than just part of it (many Forth compilers store only the first three or four characters), and, to facilitate recognising the words, the space character is included at the end of each as if it was a part of the name. The extra space character is also counted in the byte that indicates the length of the word. It is easier for the system to handle if the length byte comes at the beginning of the dictionary entry, before the name, so the compiler always knows where to look for it. Therefore, the first byte of the entry contains the length of the word name (plus the final space), and this is followed by the name itself (again, with the final space). After the name comes a

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two-byte link address which points to the absolute address of the next entry in the dictionary. Finally comes the code, which usually consists of a series of JSR instructions, terminated by a return instruction. If this is not included, the processor will try to execute the length and name of the next word as machine code, and the system will probably crash. Fig 1 shows a sample dictionary entry.

Writing primitives

After all that, getting down to writing the primitives is really quite a relief. The first primitives to write are those to push and pull numbers from the stack. It is probably a good idea to set aside a section of memory, say 10 bytes long, to act as temporary storage for primitives, and for exchange of data from one section to another. In my compiler, this space runs from TEMP to TEMP+9, and the allocation of this space depends on the function or procedure being run, although locations TEMP and TEMP+1 always hold the number to be pushed onto the stack or that just pulled from the stack, depending on the code being run. This way, the other primitives always know where the data is after it has been pulled.

After you have written the push and pull routines, the next ones to tackle are simple arithmetic and logical routines — add, subtract, and, or, not. At this stage, you may also want to add a negate, as this is not too difficult (do not confuse not and negate!). The only routines in this part of the design that might give you any trouble are multiply and divide. (Don't forget that your language may require, as Forth does, both div and mod functions, and so you should really write your divide routine to find both so that the correct answer

'Testing the basic primitives'

(either div or mod) can be selected at a higher level of the program, before the result is pushed back onto the stack.) However, although these are more complicated than the others, they are still relatively simple to write, and standard routines to find in books and library programs. If you can't get hold of suitable subroutines, designing your own is remarkably easy.

The best method is to do a long multiplication, in base 10, and at each stage note carefully what you are doing.

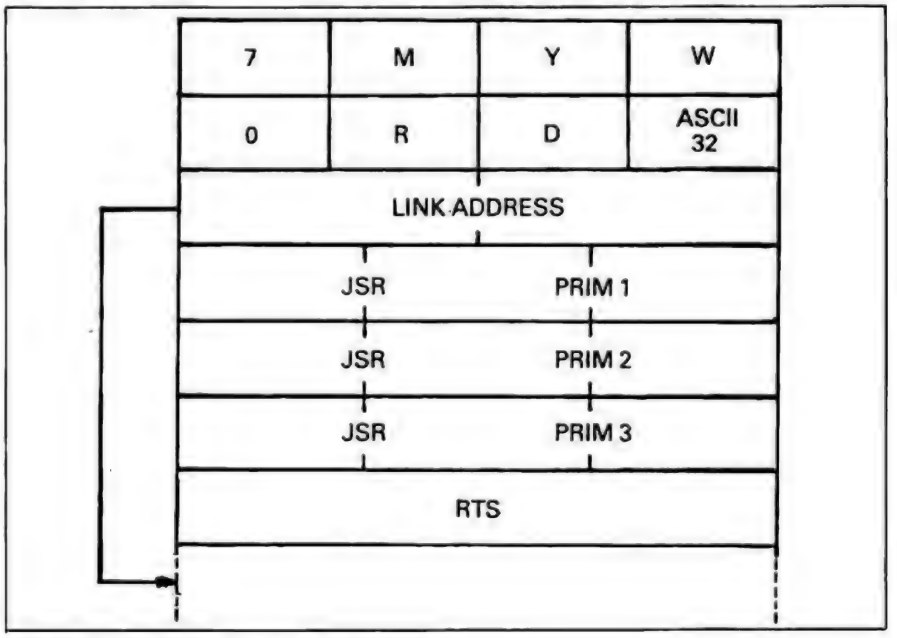
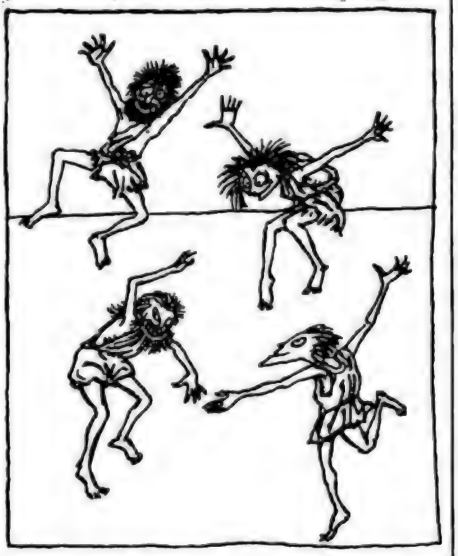


Fig 1 Sample dictionary entry

Then make up some binary numbers and try multiplying them on paper in binary, following the same steps as for decimal. Now check the result of your calculation by converting the two numbers into decimal, multiplying them, and converting the answer into binary for comparison with the answer you obtained before. When you've got the hang of this, you can code it fairly simply. A similar procedure should also show you how to write a division routine. (Note: if you're using signed integers and two's complement notation, your routines will have to allow for this.)

Now that your first primitives routines are ready, you can test them. At this stage, your compiler has no section to control execution, so you will have to use a number of subroutine calls to simulate a program running in the eventual compiler. Test each section separately, then combine them, to ensure that there are no errors due to, for example, two routines overwriting each other's temporary storage space. As you go along, keep a note of the tests you have made and the results — this can be invaluable for debugging. You should also make extensive use of breakpoints to study the flow of the program. (A breakpoint is a stop or BRK instruction introduced into the program for debugging purposes. When you think you know where the program ought to be going, but the program doesn't seem to agree with you, then you can set up breakpoints in various places to see where the program goes.)



. . . those handling looping, jumping and branching'

Now the difficult part begins: you must write the routines to handle looping and branching. To investigate how to do this, we must first note how to do looping in Forth. There are two standard Forth words to handle all looping: DO and LOOP. The word DO comes immediately before the body of the loop, and expects to find two arguments on the stack.

The first of these, on the top of the stack, is the initial value for the iteration counter. (The iteration counter counts how many times you have been round the loop, rather like the index variable in a Basic FOR . . . NEXT loop.)

The second argument, below the first on the stack, is the final value of the iteration counter plus one. The word LOOP signals the end of the loop body, so to repeat a word MYWORD 10 times, you would use:

```
11  1    DO MYWORD LOOP
```

We will now see how these words can be built in Forth. Firstly, we need a new stack, to be called the RETURN stack. This is really only for the machine's use (although Forth allows the user access to it), and it is used in loops to store the loop parameters. These parameters are the current value of the iteration counter, the final value of the iteration

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counter plus one, and the absolute address of the machine code making up the body of the loop. When Forth encounters the word DO, it calculates the address of the body of the loop (based on the position of the call to DO), and pushes this onto the return stack. Execution of the code then resumes.

Most of the work of the loop is done by LOOP. When a loop occurs, the current value of the iteration counter is pulled from the return stack and incremented. It is then compared with the final value plus one, to see if the loop is finished. If the comparison shows that the current value is less than the final value plus one — that is, the loop is not finished, then the current value of the iteration counter is replaced on the return stack, and the address of the body of the loop is read and replaced on the program counter, causing the program to loop. If the loop is over, then all its parameters are removed from the return stack.

Conditional statements

Conditional statements must be implemented quite differently. Forth uses the words IF, ELSE and THEN to handle conditions. IF pulls a value from the stack and decides whether it is true or false (in Forth, zero is false and any non-zero number is true). If the value is true, then it continues executing words until it finds an ELSE. If the value is false, it jumps to ELSE and begins execution from there. Whenever a THEN is encountered, normal execution resumes, regardless of the truth of the original value.

In addition, Forth has the relational operators <, > and = to allow conditional execution of words depending on the relationship between two objects. (Note: like all other Forth operators, the relational operators require Reverse Polish Notation. A < B is written as A B < .) A simple way of allowing execution of conditional statements is to have a flag (let's call it EXECUTE) which indicates whether or not the machine is in execution mode. When EXECUTE is set, words read are executed; when it is cleared, words which do not affect it are completely ignored. There is no need to jump to various sections of the code, depending on the outcome of an IF word. Instead, EXECUTE can be set or cleared depending on the state of the number on the top of the stack, and then all the code is stepped through.

When your looping, conditional and relational words have been written, you will have to test them. As was previously mentioned, testing these words is very different from testing the arithmetic words.

As they control program flow, the errors they produce can be quite spectacular, and may frequently result in crashing the system and losing your program. It is better to remember to make back-up copies of your program than to learn the hard way.

There is now only one section left to write — the parser. In fact, like most of the general TIL compilers, a TIL parser is very different from a parser for any other language as each word is a completely self-contained unit. The parser does no actual parsing at all — it is effectively a word recogniser. Words are read from the input until a separator (in the case of Forth, a space) is read. At this point, there is a word stored in the input buffer. The program checks to see if it is a valid number, and if so it is interpreted as such. Otherwise, the program looks up the name in the dictionary. If it is not found, an error is reported; if it is found, the appropriate semantic action is taken.

The parser, then, is a very simple routine which traps special cases before handing control to the dictionary search section. Another routine should be added which allows you to write bytes to the present output code location and update the output code pointer, and so on, to simplify the code generation. With that, you should have a working TIL compiler.

Conclusion

In general, a compiler is a major piece of software. However, the very fact that I have managed to describe a complete TIL compiler in such a (relatively) small space testifies to the ease with which such a compiler can be written. Writing a compiler gives an excellent insight into how a language works, and this can only help improve the quality of your programs.

TILs in particular are easy to implement and compact in design, making them well-suited to micros. END

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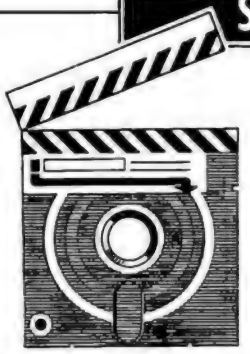


BeeArtistic

A new package for the MicroBee wrings some fine graphics out of the eight bit machine. Mark Casey reports.

Graphics are in fashion. With the advent of Gem and TopView, operating systems are moving from verbal to visual command systems. Logo is the up and coming language for educational purposes and it is graphic based. All the best business packages now have a graphics module to chart figures. Everywhere you look, computer graphics are making an impact.

Graphics fall into several categories. On the industrial side there is computer aided design, a field in which the hardware is prohibitively expensive but very versatile. Business graphics, in which the computer creates charts and diagrams from input data is another area. But it is in the field of computer art that the computer operator is achieving the most notable attention.

Software manufacturers have been only too aware of the attractions of using a computer to create pictures. Virtually every home and business micro has a graphics package available for it. Some are little more than Basic programs using the facilities offered by the resident Basic dialect. Some are sophisticated systems using graphic tablets, icons and costing a small fortune. Some, a very few, fall between these two extremes, and offer sophisticated facilities at an affordable price. BeeArtistic is one of these programs.

It is written for the ever popular MicroBee, by an Australian outfit called Exitek. It is billed as 'THE graphics package for the MicroBee'. The standard price for a 13cm disk holding the program is $49.95, plus $3.50 for postage.

The aim of the program is simple — to enable a MicroBee user to create and store complex images with the computer. That aim is admirably fulfilled.

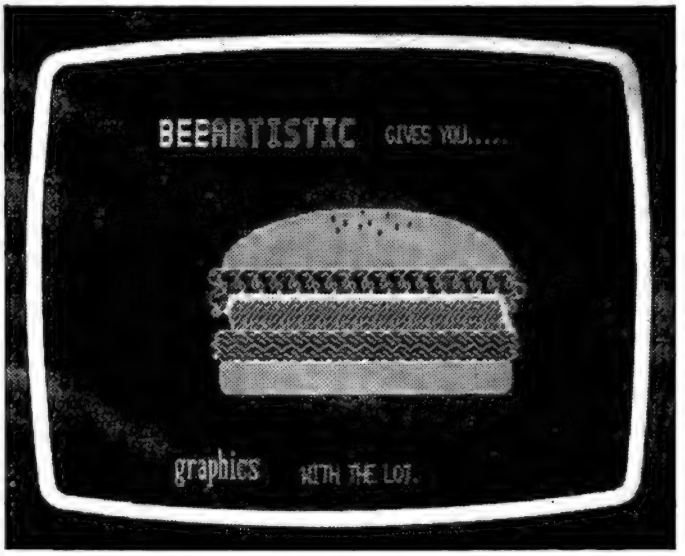
To use BeeArtistic you'll need a 32k or larger MicroBee, one or two disk drives, the CP/M operating system and a monitor. Any Epson or Epson-compatible printer can be used to get hard copy of images, and a joystick is no bad idea.

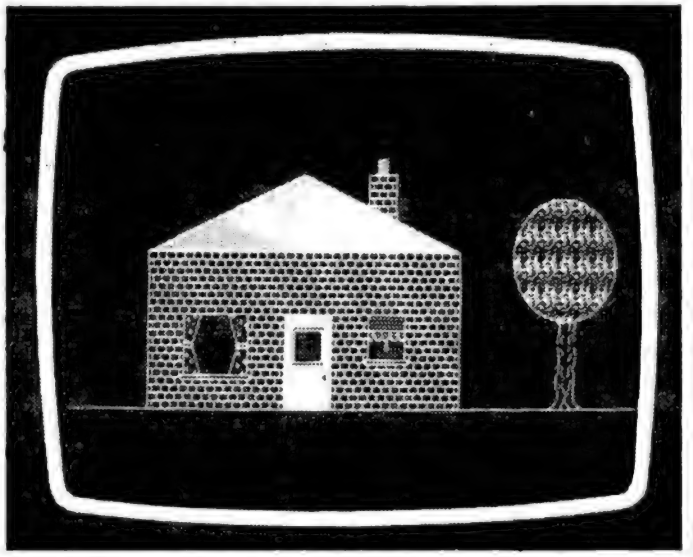
For your money you get a red-sleeved 13cm disk and an 84 page manual. After you've made a back-up working disk, you are ready to go.

Loading takes about fifteen seconds, with a brief title screen and a copyright notice before the program proper. You start with a stubby pencil in the middle of the screen.

Icons

Exitek has designed BeeArtistic to be powerful without being complex. It has followed the icon path pioneered by





It may only be an eight bit micro, but BeeArtistic squeezes an awful lot out of it.

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Swivel Base Extra

Macintosh. Commands can be activated through the use of icons. There is no need to memorize an arm's length of key combinations to use the available features, though single key commands are possible and quicker to use than the icons.

Those features make a stunning list. Besides the usual line, circle, box and fill routines, the user can create patterns, add text, zoom in on a portion of the screen for pixel by pixel editing, invert, mirror or reverse the image, save parts of the image to a clipboard and even link together a series of pictures to make a computer art slide show.

Accessing the command icon menu is by pressing ?. A couple of seconds later a grid of 24 command icons appears on the screen. Some of these lead to secondary menus or dialogue boxes and almost all have single key equivalents.

All movement of the cursor or icon selector is by either a joystick or keys. The MicroBee is a nice enough machine, but one thing it lacks is cursor control keys. So, using the keyboard involves pressing CTRL and one of a diamond of eight direction keys. Pressing the fire button or space bar initiates an action.

Another thing the MicroBee hasn't got is speed. At each press of a direction key combination, the choice indicator on the menu is erased, moved and redrawn. Moving from top to bottom of the menu seems to take forever, especially if you are in a hurry. You'll soon learn the single key commands, out of frustration more than anything else. Still, icons are fine for starters.

On the drawing screen, the rate of tool movement can be adjusted by pressing a key from 1 to 0. The slowest rate is almost a pixel at a time. The tool can also be positioned at screen edge by pressing CTRL, Q and the appropriate direction key.

If all this sounds a little tedious, get a joystick. Using keys is fine for straight lines, but it does inhibit the drawing of curves and doodles. If you need straight line precision, change from the joystick back to the keyboard. As for the speed, remember that the MicroBee is only an eight bit micro. The old timers may be a little slower than the new whippersnappers, but they do the job nonetheless.

There are three drawing tools — pencil, brush and spray. Each of these can be active or inactive, toggled by the space bar. The tool icon changes to indicate if the tool is active or not. To draw shapes, just activate the tool and move it with the joystick or direction keys. The process is slow but you get there in the end.

To draw lines from a set point, use the mark and line facility. A single point is marked on the screen with a cross and the tool moved to where the end of the line should be. Activating line joins the mark and tool. The mark remains where it is set until cancelled or repositioned.

Ellipses

Extensions of this are the box and circle features. Box rapidly draws a rectangle with opposite corners at the mark and tool respectively. Circle in fact draws both circles and ellipses, in a manner which you have to experiment with to understand. The rectangle formed by the mark and tool covers a 90 degree arc of the drawn circle. To get a perfect circle involves positioning the tool exactly the same distance on X and Y axes from the mark. If you get this, or anything, wrong, U is the undo command. Circle is thus very versatile, but takes practice to master.

Paint is the command that fills enclosed areas with a selected pattern. Filling is slow but efficient. A gap in the area causes paint to spill out onto the surrounding screen, but ESC stops the fill and U undoes the action.

Attempting to draw a great deal on the screen can lead to an OUT OF PAINT error message. The authors have redefined each of the 128 MicroBee characters to be a graphic element. Using too many elements consumes the memory rapidly. One limitation of BeeArtistic is the amount you can draw. It is not a great deal.

The type of line that can be drawn is fixed — no pattern options exist. The brush, spraycan and eraser shapes can be altered, with 32 shapes to choose from. The pattern drawn by the paint and brush commands can be changed too, with 31 options available. Bricks, diamonds, dots, checks are all there, plus many others.

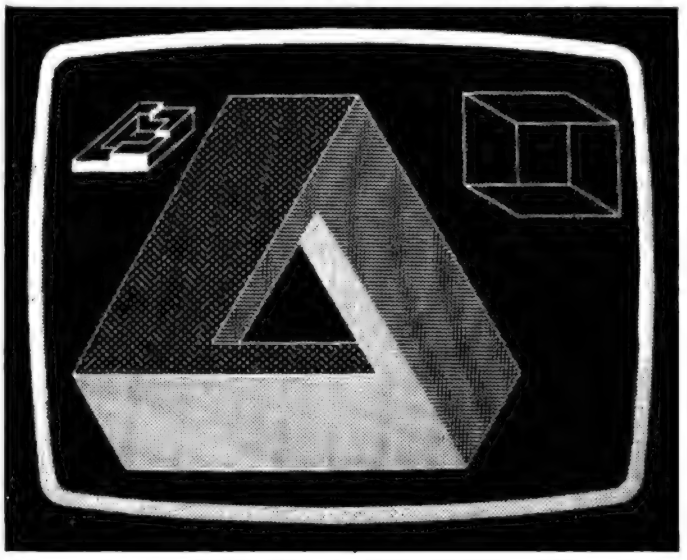
Information

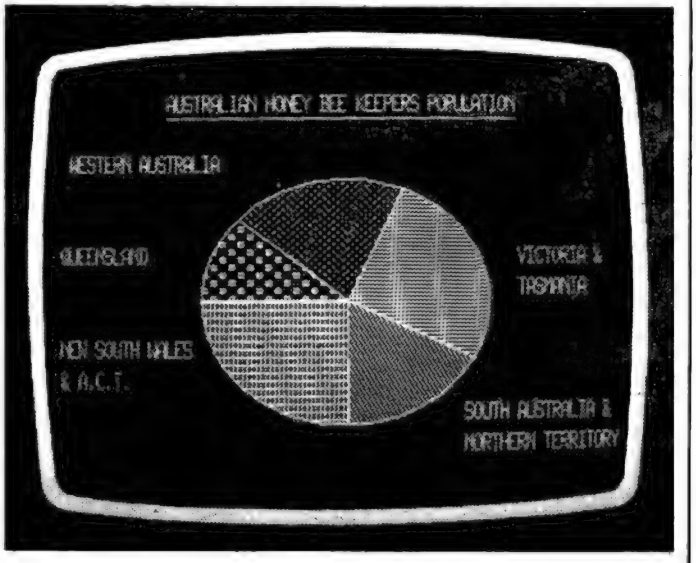
If you lose track of all the patterns and brush shapes, an information option shows the current tool, brush shape, pattern, paint type, mirrors and clip board contents. It is a useful feature.

Erasing work is by either the eraser tool, with the eraser shape chosen from the shape menu or the Zap command, clearing the whole screen.

Adding text is simple enough — press T and type away. There's only one font and only upper case is used.

BeeArtistic has 25 special icons that can be included on screen. They are selected from a menu and become the tool, positioned when the space bar is pressed. The patterns include musical





symbols, card suits, electrical symbols and a few others.

These icons can be edited. Delete an unneeded icon, copy another icon into its place, activate the fine detail editing screen and pixel by pixel construct a new icon. It is a slow process, but icons can be saved, and it is a useful facility. In a similar way you can create your own brush shapes and paint patterns.

If you have already created a suitably sized icon on screen, it can be moved to the icon, pattern or brush shape menus with a clipboard facility. Watch the size of the section to be moved, as it is fixed by the program.

The fine detail editor is used to edit sections of a screen image sixteen pixels square. The area is magnified to one-third screen area and individual pixels toggled on or off.

Duplicating small areas of the picture is done with a move command. The area is only small, so moving large areas is tedious. Copy is similar, though it doesn't destroy the original area.

There are more tricks in store. Mirror is a command option that reflects what is drawn with the brush along either the X or Y axes, or both. It is an option for the drawing of symmetrical patterns.

The single colour painted with can be either foreground, background or reverse of what is being painted over. There is no multicolour option — your pictures are monochrome only.

A screen image menu offers three more options. The entire image can be transformed into inverse video, or flipped about the X or Y axis. Then you can move the screen image up or down, losing any part of the image that goes off the screen unless the action is undone.

Pictures can be saved or loaded to or from disk. They can be printed out too, on an Epson-compatible printer. Saved pictures can be strung together to form a slide show, using a second program called BeeSlide. Create a WordStar file of the names of the pictures and run BeeSlide.

Conclusion

That is BeeArtistic. It has a host of features and works very well. It has some limitations — the speed imposed by the processor, limited memory for pictures, no colour facility, a tricky circle command and no line options, but overall it is simple enough to use while being versatile enough for quite demanding tasks. At $49.95, it is well worth the money.

Exitek also makes a tutorial version for schools, costing $59.95. It has an eight lesson interactive tutorial for primary and secondary students, teacher and student manuals.

A site licence version of BeeArtistic costs $195. A network version, written for the Starnet system, costs $295. It comes with Starnet software.

END

BANKS' STATEMENT

In the know

Human intelligence created artificial intelligence, but a catalyst is required to reconcile the two. Martin Banks utilises his grey matter.

When I first heard the phrase 'artificial intelligence', I assumed it referred to me. I have therefore deduced that intelligence is just a fly in the eye of the beholder and has little to do with reality.

Later I discovered that the phrase actually refers to something completely different and even more nebulous: the word 'intelligence' is being applied specifically to machines. Now, depending upon how you view things, this is either an absolute and totally true way to see intelligence, or its diametric opposite.

There are no doubt those individuals who would consider it true that, when compared to the vagaries and general stupidities of the human race, it is only machines that can possibly be intelligent. This is an argument which has a lot going for it: a car, for example, very sensibly sits still and watches the world go by until some dumb human climbs inside and drives it at 160kph into a wall. Which, I ask, demonstrates the most intelligence?

The only problem with this line of thought is that all the machines have been developed by humans in the first place, so any flaws in intelligence the humans have will be inevitably transferred to the machine.

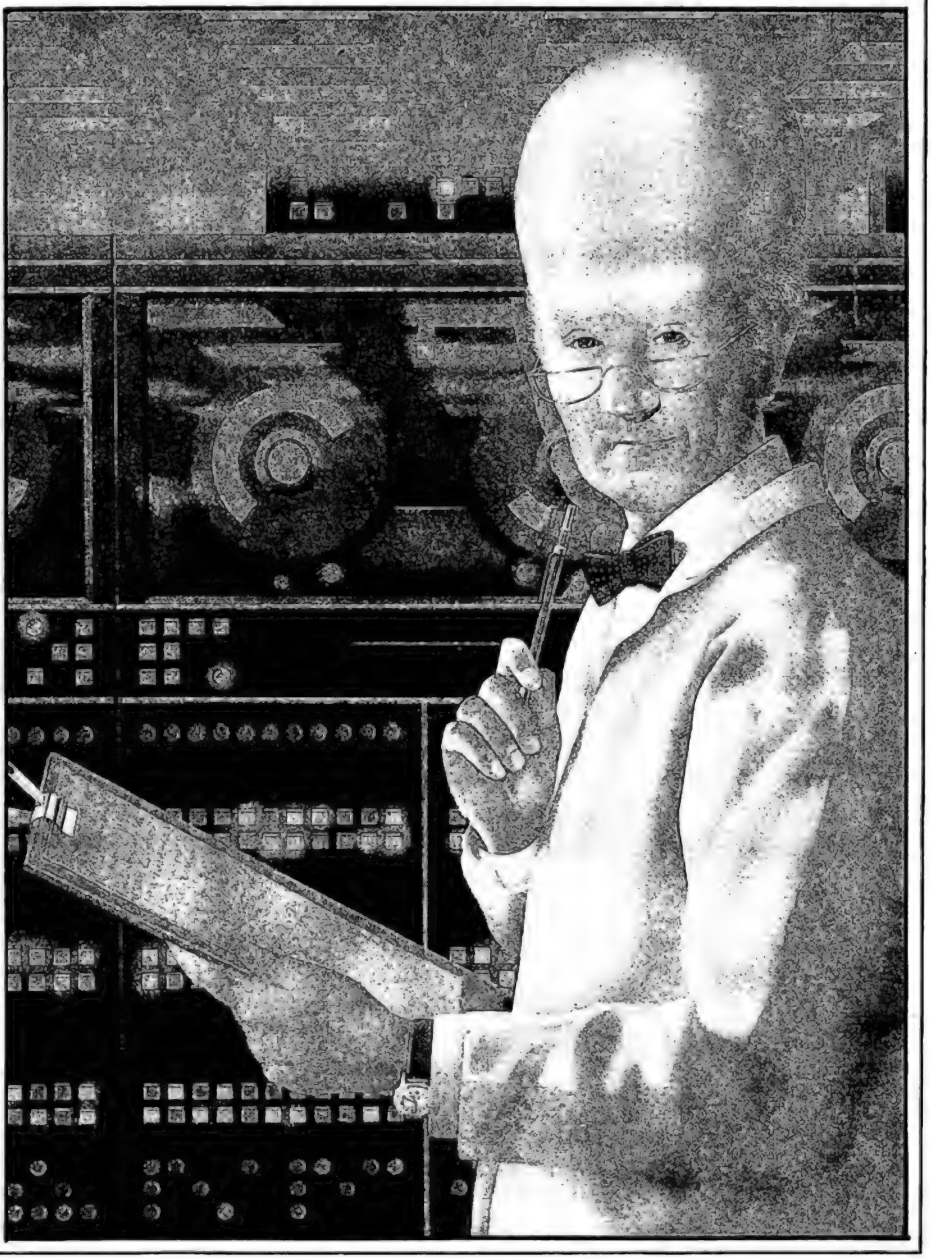
It can be safely argued that machines can have no more intelligence, artificial or otherwise, than humans. As has already been pointed out by a simple example, however, humans seem to show a remarkable lack of the stuff anyway, so it might just be possible to argue that it doesn't exist at all.

If that is the case, then a great many companies are spending enormous sums of money trying to produce an artificial version of something that isn't there.

According to one researcher in the AI field, Dr Floyd Hollister of Texas Instruments, the subject should not be called 'artificial' intelligence at all. Rather, he feels that its proper name would be better as 'applied' intelligence. Given the aforementioned doubts about the whole subject, this sounds potentially worse, although it does in practice sum up more succinctly (and less ominously) what the research work is all about.

What everyone is trying to achieve, of course, is a system that can be taught a set of generalised 'rules' which apply to a specific problem area; the idea being that, working within these rules, the system will be able to solve a particular problem just like any good human expert. Dr Hollister does point to the fact that 'intelligence' in this context is a word of dubious connotation, for it can give far greater anthropomorphic qualities to a computer than it warrants.

His point is that a human expert in one particular field can also be expert in, or knowledgeable of, a number of other subjects as well. The computer, once outside its defined set of rules, will simply default back to CP/M-80 level, or whatever else is its native mode. That, he feels, is one measure of human



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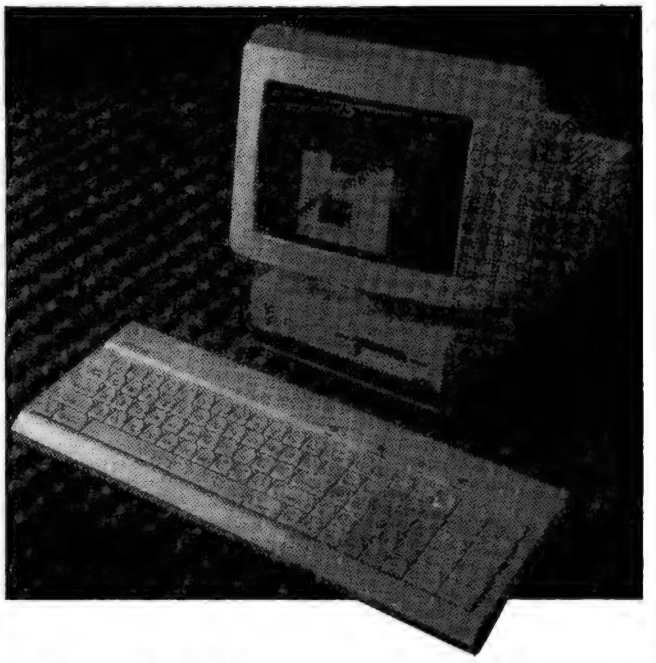

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intelligence, especially when compared to a machine.

The real problems with AI lie not with such semantics, however. Rather it is the way in which we humans can sensibly apply it, and how it will be realised in practical terms.

Dr Hollister is a keen promoter of a new generation of individuals who will help the rest of us apply AI systems in everyday life. He is aware of the common feeling that AI systems, when applied in business and industry, will lead to massive loss of jobs. The prospect of AI producing millions of industrial robots that will put everyone out of work is, he feels, a problem that has to be overcome.

He sees there being scope for new types of employment stemming from the application of AI, especially for those with an understanding of computers and of another discipline which, for the sake of argument, I will refer to as the 'target discipline'. The real need is going to be for people who can translate from the target discipline into some form of computerese that the programmers can cope with.

Hollister, like others before him, uses the phrase 'knowledge engineers' to describe such people, and their role in the development of computing applications could be crucial. At best, they will help people apply computing power in a sensible and useful way. At worst, they should prevent a few disasters.

As we move increasingly towards a more comprehensive application of computing power, as opposed to its current, fairly specific application to tightly-defined tasks such as spread-sheeting or word processing, we are going to need more people of the knowledge engineer type. Although, as Dr Hollister points out, such people should have a good knowledge of the target subject area, for example civil law or medicine, the real trick will be in them having enough awareness to be able to see the relationship between their pet subject and the dreaded computer.

At last, there will be a market, within the computer industry, for people with a modicum of common-sense.

As to the question of how such systems are to be realised, the immediate answer is by normal, Boolean logic computer systems. In the long term, however, there could be something that matches the concepts of commonsense and intelligence rather better — fuzzy logic.

This is the new in-thing of AI and expert systems development, although its roots go back 20 years to the theories of Professor Lofti Zadeh. He has defined fuzzy logic as 'the logic which underlies approximate reasoning'. He maintains that most human reasoning is approximate, and that any actual decision-making process is based on a series of successive approximations of what seems to be a reasonable idea.

This approach to logic can overcome the problems caused by the Boolean logic premise that there is only one 'truth'. In Boolean for example, if A is true and B is true, then C must have just one value.

With fuzzy logic, the value of C will depend on the degrees to which A and B are true, which allows all kinds of variables to impinge on the result. This is, approximately, what happens when humans get round to thinking.

It can be deduced from all this that the ideal people to be working with AI and expert systems are those with a fuzzy kind of common-sense. There may be hope for me yet.

END

Martin Friedman

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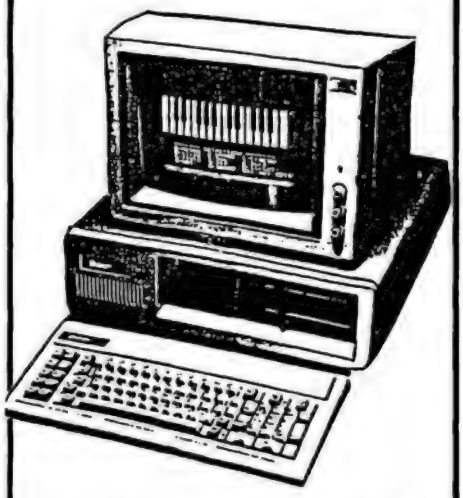

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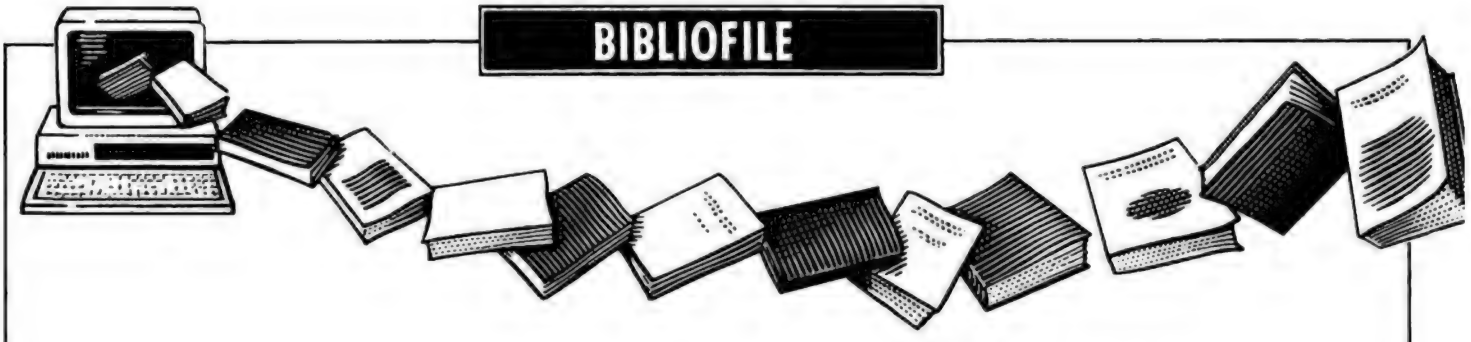

From a vast tome on Symphony to patches for the Commodore 64 — David Taylor casts his eye over this month's literary choice.

Symphonic key

It's not as if purchasers of Symphony are short of something to read. This whopping package (six floppies, needing no fewer than 320k of RAM just to boot) comes in a small plastic suitcase containing a 438-page Reference Manual, a 308-page How-To Manual, a further fat Introduction Manual, a separate Glossary and a Quick Reference Guide. To this manual mountain, and to America's massive range of Symphony manual re-writes, Mr Cobb now adds another 760 pages and, if you weaken, will sign you up for his monthly *Symphony User's Journal*, too. 'Patience is one of the keys to learning Symphony,' he asserts. You might need a good optician, too.

Symphony is at heart a spreadsheet, points out Mr Cobb, but not just any old spreadsheet. The act it has to follow is Lotus 1-2-3 with its half a million devotees. Once, way back in 1983, that was the IBM PC's most powerful piece of figure crunching software and an instant bestseller worldwide. Symphony has to surpass it and, moreover, has to compete with such robust rivals as Framework and Open Access.

All combine awesome spreadsheet power with the current fashion for integrated graphics, word processing, database management and (all-American) communications. All take ages to get to know inside-out.

No question but that Cobb, author of a similar big-selling tome on Lotus 1-2-3, knows the score on Symphony, or that he believes it to be the bee's knees. His text is commendably lucid, if wide-eyed at the wonder of it all. Not a whisper of any Symphonic shortcomings (such as the fact that the comms package supports only two modems, neither usable in Australia) and lots of praise for the word processor which is OK but scarcely any match for the best wp-only packages like Microsoft's Word or Samna.

Still, *Mastering Symphony* is as thorough-going as it is uncritical and as such is a useful adjunct to the Lotus texts, good as they are. Cobb's next job, presumably, will be to set about another brick-sized book for Symphony customers planning to use the extra speed and memory of a PC-AT. I feel for Mrs Cobb who, as is acknowledged at the start of this book, wondered if she would ever see her husband again.

Mastering Symphony

Author: Douglas Cobb
Publisher: ANZ Books
Price: $49.95

Thinking machines

Artificial Intelligence, according to an authority named Minsky, is the science of making machines do things that would require intelligence if done by men.

It is also, according to Yazdani and Narayanan, a hot potato. In America, AI is a respectable area for academic research and, with the increasing popularity of so-called Expert Systems (sophisticated software for use in place of human expert opinion) Americans are now taking a close commercial interest in AI besides. The Japanese, with their Brave New Vision of fifth generation computers running the whole human show, are equally intense with their AI deliberations. In Britain where this book was written, the whole vexed subject is still a bit, well, *suspect*.

It isn't that they're short of boffins. Thanks to Governmental initiatives, researchers need not be short of cash either. Nevertheless, it is suggested that the British tend to come at the idea of AI with typical reserve, thinking machines don't seem to strike them as quite *respectable*.

Masoud Yazdani and Ajit Narayanan are lecturers at Exeter University. They are thus academics and no doubt thoroughly respectable. There's no mistaking their studiousness as here they assemble a collection of learned, and at times stupefyingly impenetrable papers by more academics on the whole intractable subject of what exactly Artificial Intelligence is and where it might or might not be taking us. Their purpose, they stoutly maintain, is not to draw conclusions —

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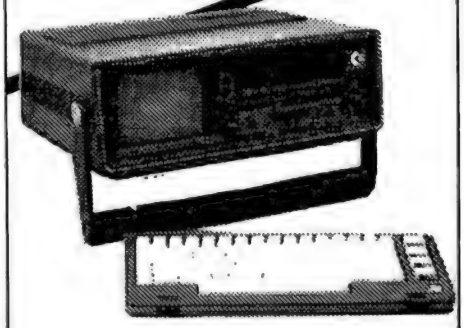

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merely to encourage lively debate.

Debate we do get but lively it's not. We get discourse on the computer in medical diagnosis or legal counsel. We get a discussion on the social and philosophical implications of AI. AI methodology is examined, AI in education looked at. It sounds interesting enough, but it would take a computer with a brain the match of Einstein's to unscramble some of the contributors' lead-weighted style: 'We consider that one of the biggest blocks to a healthy interaction between psychology and AI is what Pettitt has called AI-centricity. A common conceptual error of the AI-centric is the naive belief in a simple dichotomy between what Miller calls theory development and theory demonstration . . . '

There is a tremendous amount of thought-provoking, not to say brain-twisting argument and counter-argument in this book, but it is strictly for those who can get along with academic writing at its knottiest.

The last word ought to go to Narayanan, who frankly states: 'We have raised many questions. A cynic could well argue that current research in AI is doing nothing more than providing jobs for a small but expanding elite in esoteric, specialist topics or large, defence-oriented areas, with there being little hope that the vast majority of us will ever benefit in some concrete way from the research, where by *benefit* we mean an accepted and proven gain rather than one which is advertised as being a gain by the elite who spend our money researching into it. The cynic may well have a valid point.'

Artificial Intelligence: Human Effects

Editors: M Yazdani and A Narayanan
Publisher: John Wiley
Price: $31.25

Second best

ProDOS, bubbles Mr Campbell, is Apple's exciting new disk operating system with new commands, expanded and improved old commands, file management utilities, assembler, data types, file types and new procedures — everything anyone could ask for the Apple II family.

True enough, I suppose, but what is undoubtedly a damn sight more exciting is Apple's new family of Macintosh computers.

Still, this book is only for those who are stuck with early Apples and looking for an improvement on their DOS 3.3 capability. They should like it. Campbell describes in patient detail all that ProDOS is and does, and attaches examples and listings. I couldn't fault it but I can't pretend I found it an absorbing read. I dare say the same would go for any Apple user who's laid hands on the incomparable Mac.

Inside Apple's ProDOS

Author: John Campbell
Publisher: Prentice-Hall
Price: $27.50

Suggested recipe for Commodore 64

If you have a Commodore 64,

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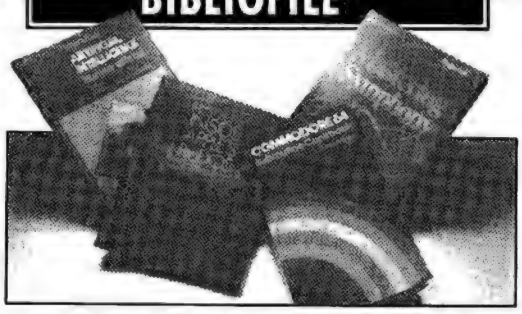

a sound knowledge of its Basic, enjoy writing your own programs and have $13 to hand, you shouldn't hesitate. This little book spells fun.

What Busch does is provide a set of machine-specific subroutines for you to merge into your own listings (some will run on their own) and thus provide instant tricks like sound effects (gunfire, klaxons) an elapsed timer, joystick subroutine, colour peeker, games routines, or small-time business and financial add-ons that will calculate interest rates or simply tidy up display formats.

There are some 70 such 'recipes' — some trivial, some patching up the gaps in Pet 2.0 Basic, a few providing useful comms support, but it's all rather mundane when set alongside more modern machines. Commodore 64 users generally have my sympathy, but as I was reminded the last time I was a bit sniffy about this machine, there are an awful lot out there and thousands swear by them. For them, if for no-one else, I can unhesitatingly recommend this book.

Commodore 64 Subroutine Cookbook

Author: David D Busch
Publisher: Prentice-Hall
Price: $12.95

TIRED OF YOUR PRECIOUS COPIES OF APC BEING USED AS A DRINK COACTER OR SAND BOX FOR THE CAT?

ORIENT EXPRESS

In this month's Far East report, Shinichiro Kakizawa tries baby-talk with cuddly robots and introduces the latest innovation in add-ons, a high-res image scanner.

Playing around

Japanese toy manufacturers are always adventurous with new technology. Particularly in the micro electronics area, they're always keen to try innovative components, even though the technology has not yet matured.

At the Tokyo Toy Fair 85, housed in the large Harumi Exhibition Centre overlooking Tokyo Bay, over 20,000 toys, including video and electronic games, and general toys, were on display.

The general impression at this year's show was of a preponderance of robots. There were lots of traditional cuddly toys, hula hoops, model trains, building blocks and games computers, but even these did not escape the innovative mind of young Japanese toy designers. I spotted an ordinary-looking teddy bear with a voice-recognition synthesising feature built-in. Responding to a child hugging it and talking to it, the bear came back with a cute but unintelligent response, 'ah-ah' or 'boo-boo', as if it were a baby.

The response from the bear is not always the same. The computer circuit is cleverly contrived to react to the tone and volume of the owner's voice, giving slightly different responses accordingly.

Traditionalists sometimes find the introduction of high-tech children's toys hard to accept, but toys should give scope to children's creativity and imagination.

Among hundreds of robots, there was a couple of interesting new models. The first, Science Robo-RK from Bandai, can manage real two-legged walking. Its balance is controlled by a gyroscope, which is powered by the built-in direct drive motor. A separate motor is provided for driving the legs and knees.

The direction of movement is radio-controlled, and its gait as it paces about is smooth and fun to watch. This toy ... approximately $... claims that Robo ... world's first real, ...

Also featured was ... called SR3 from Tomy. A reactive robot, it swings ... armé and moves its neck as it walks. Shouted at loudly from a distance, or scolded, it suddenly stops walking, hangs it head, and mutters an apology. Having put it in its place, you can then smile and feel better. A useful tool for easing stress when everyone else seems to have the upper hand! The price is around $35.

Another model, the Omni 2000 robot, is also from Tomy Industry. Omni 2000 is a multi-function, sensor-based, voice-recognition robot. Its function is a little beyond the toy capability — it can carry goods by hand. In addition to doing ordinary work like carrying coffee cups and putting out recorded messages ... if you have a han... rechargeable ... home, you b... robot and it w...

The robot's sens... obstacles such as ... chairs, changing ... automatically a... work. For ... between a ...

Japanese ... appear to ... major ... compu... Mel... not m... has s... the game... the show had an interesting new feature, an IC card. IC cards are a memory device in card form (credit card size), and are currently hot news in the Japanese computer industry.

They're slightly thicker (2mm) than normal plastic credit cards but can store vastly more information than the ordinary magnetic strips. IC cards are used by the Z80A-based Sega SC computers, and can store 256k in an embedded EPROM. Games and educational programs are provided in card form, which is a lot easier to carry and store than the conventional cassette tape ROM cartridges.

... which caught my ... king building ... um-cleaning ... it on a ... with ... m cleaner built in ... ttom.

In addition, budding Carl Sagans may like a digital watch which can display the location and flying route of Halley's Comet.

Hi-res image

A low-cost image scanner is now available from Marcus of Tokyo, priced at only $200. Model RA 408 is an image input device for a micro, and has two levels of resolution in scanning. The high-resolution level provides eight dots per millimetre, and the lower level gives four dots. Colour contrast control is variable. A dots compression feature of up to ... also provided.

... scanner has ... become the most pop... on among the Japanese ... suppliers, but the prices of the device from large ... manufacturers such as Fujitsu, NEC, Ricoh and Canon are in the range of $2... to $3000, so are hardly w... the budget of the average ... However ... RA-408, ... and users ... of pictures ... changes ... text ... print ... scanner ... should certainly vastly ... the scope of applications for micros.

this year, the number will probably reach five million units.

Yamanouchi-san,the company president, is confident in succeeding in the American ... computer market which ... ated by the ... Atari ... VIC-20 and a ... powerful suppliers, ... which subsequently collapsed. Yamanouchi-san views this near-vacuum as a God-sent opportunity,and wants to fill the gap with his 'Fami-Com'.

Highlights of his marketing strategies for the American market will be a low-price ($100), high-speed colour graphics, and a completely new concept in games.

The American version of the Fami-Com is code-named 'Nintendo video system', and will be shipped as from August.

In the States, a part of Atari was bought in February by another Japanese games machine company, Namco. It will be interesting to see how the Japanese games leaders, Nintendo and Namco, can score in the American market.

Perfect printing

Brother, the typewriter and printer manufacturer, is soon to launch a new printer. ... major feature of the new ... called Twinwriter 5, is ... two printing ... daisywheel and ... dot-matrix, in one box.

The user can specify daisywheel mode for word processor printing, and the wire dot mode for those printing requirements when a fast result is called for. Switching from one mode to the other can be ... manual or ... control. This product is a welcome ...

American bid

Nintendo, the Kyoto-b... games computer ... sides the Ame... the next ... achie... ... ROM, ... logic ... eight expansion slots. ... its Kaypro implementation; the 80286 chip has sprouted a large heat ...

... 1995 ... Computer Payment ... sing; ... 80286 ... ee-

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LAZING AROUND

Brain-teasers from J J Clessa

Quickie

If I spend 25 per cent of the dollars in my wallet, and give away three-quarters of the rest, I'll have $6 left. How many dollars have I got?

11319

Prize Puzzle

A bit easier than usual — but you will need your micros for it. What number when divided by 11 and multiplied by 13 gives the original number in reverse? Answers on postcards only (or backs of envelopes) to *APC* Prize Puzzle, October 85 Lazing Around, c/-*Australian Personal Computer*, 2nd floor, 215 Clarence Street, Sydney, 2000. Entries to arrive not later than October 30, 1985.

July Prize Puzzle

This one must have been a bit harder than usual, since only about 50 entries were received. One reader said he gave up on his own PC and used the larger machine at work.

At the time of setting the problem I only had one solution — 5671 which splits into 2701, 1485, and 1485. As many of you pointed out, 5886 is also a solution — forming 1596, 2145 and 2145.

Both of these solutions can be deemed to be 'well over 5000 birds . . .' and therefore I accepted either for prize eligibility (the next solution was in excess of 12000 so was disqualified).

The winning entry came from Andrew Roberts of Brisbane. Congratulations, Andrew, your prize is forthcoming.

NUMBERS

Mike Mudge delves into Exponential Diophantine Equations and reveals a winner for Problems with Primes.

Exponential Diophantine Equations require the minimum of mathematical background; interesting results are readily found using simple search techniques. Theoretical results, using techniques of modular arithmetic are incomplete, however, because of the close relationship of the subject of Exponential Diophantine Equations to Character Theory of Finite Groups, it is currently an active research area.

Mathematical background

0) a,b,c,d,e and f are to denote non-negative integers. 0,1,2,3, . . .

1) x^a where a is greater than zero means the product of a-factors each equal to x. For example $3^4 = 3 \times 3 \times 3 \times 3 = 81$. $x^0 = 1$ by definition, whatever the value of x, this definition is made to guarantee consistency with the laws of indices which result from the above definition. For example $(x^a)(x^b) = x^{a+b}$ also $(x^a)^b = x^{ab}$.

2) A Diophantine Equation (after Diophantus of Alexandria, *circa* the third century of the Christian era) is one which is to be solved in integers, in general both negative and non-negative.

E Dubois and G Rhin (1976) together with H P Schlickewei (1977) have established that the equation:

$w^a \pm x^b \pm y^c \pm z^d = 0$ has only a finite number of solutions for a,b,c and d when w,x,y and z are distinct prime numbers (given).

The problem

We shall confine our attention to the Exponential Diophantine Equation $1 + w^a = x^b y^c + w^d x^e y^f$ and in particular to the case where w,x and y are consecutive prime numbers in some order.

Disregard the trivial solution (a,b,c,d,e,f) = (a,0,0,a,0,0) which results immediately from the fact that $x^0 = 1$ for any x.

Case 1 w,x and y are the primes 2,3 and 5 in some order.

Order A w = 2, x = 3 and y = 5.

We wish to find non-trivial solutions of the equation:

$1 + 2^a = 3^b 5^c + 2^d 3^e 5^f$.

There are known to be 31 such solutions of which some are given here (a,b,c,d,e,f) = (3,0,1,2,0,0); (5,0,2,3,0,0); (6,0,2,3,0,1); (7,0,3,2,0,0); (10,0,4,4,0,2)

Determine the other 26 non-trivial solutions.

Order B w=3, x=2 and y=5.

We wish to find non-trivial solutions of the equation: $1+3^a=2^b5^c+2^d3^e5^f$.

There are known to be 24 such solutions of which some are given here (a,b,c,d,e,f) = (2,0,1,0,0,1); (3,0,2,0,1,0); (2,3,0,1,0,0); (8,8,2,1,4,0);

Determine the other 20 non-trivial solutions.

Order C w=5, x=2 and y=3.

We wish to find non-trivial solutions of the equation: $1+5^a=2^b3^c+2^d3^e5^f$.

There are known to be 20 such solutions of which some are given here (a,b,c,d,e,f) = (1,0,1,0,1,0); (3,0,4,0,2,1); (2,3,0,1,2,0); (5,10,1,1,3,0);

Determine the other 16 non-trivial solutions.

Case 2 w,x and y are three other consecutive primes in some order. How many solutions are there? What are they?

There is plenty of scope here using (w,x,y) = (3,5,7) or (5,7,11) or something much more ambitious such as (12911,12917,12919).

Readers are invited to submit their program listings, together with hardware descriptions, run times, any comments and of course the output relating to the above problem.

These results will be judged for accuracy, originality and efficiency (not necessarily in that order), and a prize will be awarded to the 'best' entry sent to Mike Mudge, c/- *APC*, 2nd floor, 215 Clarence St, Sydney, 2000.

Please note that submissions can only be returned if a suitable stamped addressed envelope is provided.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

Melbourne	1985 Ireecon International Contact: Cherie Morris, IREE, Box N127, Grosvenor St Post Office, Sydney 2000. (02) 29 4051	September 30-October 4, 1985
Adelaide	Business Systems and Communications Expo held jointly with the SA Computer '85 exhibition. Contact: Business Systems and Communications, PO Box 259, Roseville, NSW 2069.	October 8-10, 1985
Canberra	Infotex '85. Contact: HCH Consulting Pty Ltd, PO Box 691, Cheltenham, Vic (03) 583 6110	November 6-8, 1985
Sydney	Macworld Expo '85. Contact: Macworld Expo (02) 260 0232, (008) 23 0138	November 6-9, 1985
Brisbane	Computer Expo '85. Contact: Robert Woodland Exhibitions, 50 Sherbrooke Rd, Acacia Ridge, Brisbane, Qld 4110. (07) 372 3380	November 6-9, 1985

END ZONE

BENCHMARKS

A list of Benchmarks used when evaluating micros is given below. An explanation can be found in the February '84 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END
```

```
100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END
```

```
100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END
```

```
100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN
```

```
100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB220
170 FORL=1 TO 5
180 NEXTL
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN
```

```
100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXTL
200 If K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN
```

```
100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

END ZONE

USER GROUPS UPDATE

Below is a list of updates and additions to the full User Groups Index published in the August issue of APC. The next full listing will appear in the December issue of the magazine.

NEW SOUTH WALES

Wagga Wagga Computer Club. This general micro club meets on the second Wednesday of the month at the corner of Simmons and Johnstone Streets (in an office). For more details write to PO Box 844, Wagga Wagga, 2650.

Blakehurst Computer College, BBC User Group. Meetings are held monthly. For details call Marie Michaels on (02) 546 7502.

Sydney MicroBee User Group. Some changes: the new editor and president is David Butler; SMUG's contact address is PO Box C233, Clarence Street, Sydney 2000. The Group meets on the third Saturday of each month in the hall of the Strathfield Girls High School from 1pm to 5pm. All welcome. Phone contact with the Group can be made between 7pm and 9pm Monday to Friday except Wednesday on (02) 638 2993 (David Butler) or between 7.30pm and 9.30pm Monday to Friday on (02) 810 4758 (W. Saillard, Liaison Officer).

Albury Wodonga Apple User's Group. Refer to listing under 'Victoria' below.

VICTORIA

Yarra Valley Commodore Users Group. The Group meets on the first Tuesday of each month at the Melba Hall on the corner of Market and Castella Streets, Lilydale at 8pm. Enquiries can be directed to Barrie Vickers (the Secretary) on 735 0638 or Jon Hall (the Librarian) on 725 0176.

Melbourne PC User Group. The Group caters for IBM PCs and compatibles, produces a substantial magazine and meets on the second Wednesday of each month at 6pm in the Ground Floor Auditorium of Clunes Ross House at 191 Royal Parade, Parkville. The Secretary can be written to c/- Pannell Kerr Forster, 500 Bourke Street, Melbourne, 3000; or called between 6 and 8pm on (03) 830 5067.

Western Suburbs MicroBee Users Group. Meetings are held on the first and third Thursday of each month at the Multiple Sclerosis Centre on the corner of Furlong and St Albans Roads, St Albans. More details may be obtained from Ian Walker on 741 3625 or Bradley Bouchaud (Secretary) on 336 1019.

Albury Wodonga Apple User's Group. The Group caters for Apples and clones and meets on the second Wednesday of each month at the Wodonga High School at 7.30pm. The contacts are Jenny Scott (Secretary) on (060 24 3225 and Don McLennan (President) on (060) 46028.

Personal Programmers of Melbourne Club caters for all hand held computers or calculators. Meetings are on the third Tuesday of each month on the ninth floor of the Monash University Menzies building at 8pm. A monthly newsletter is produced. For more details write to Paul Cooper, 40 Karen Street, Box Hill North, 3129.

Turbo Pascal User Group. The Group meets on the first Wednesday of the month in Meeting Room C in the RMIT Union Building at 6.45pm. More details may be obtained by writing to Ron Savage, PO Box 81, East Caulfield, 3145.

SOUTH AUSTRALIA

Adelaide Sega Users Group. Meetings are on the first and third Wednesdays of the month, starting at 7pm at the Lutheran Church Hall, 137 Archer Street, North Adelaide. For more details call Jamie Andersen on (08) 263 5020 after 4pm.

Aquarius Users Club. The Club doesn't have an exten sive membership list but does produce a bi-monthly newsletter. The membership fee is $5 per year which includes a subscription to the newsletter. Interested parties should send a cheque or money order for $5 to the Aquarius Users Club, 7 Duncraig Lane, Stirling, 5152 including details of their computer's memory size.

QUEENSLAND

Macintosh Association of Queensland. Catering, for Macs and Lisas, the Association meets on the second Saturday of each month at 2pm in the library of the Coorparoo State High School, Cavendish Road, Coorparoo. More details can be obtained by writing to Mark Dancer, 49 Fanny Street, Annerley, 4103.

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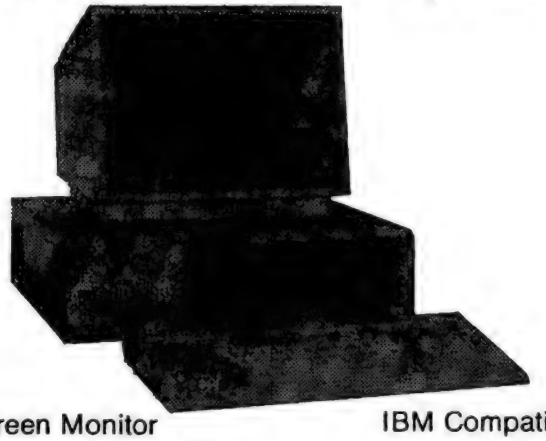

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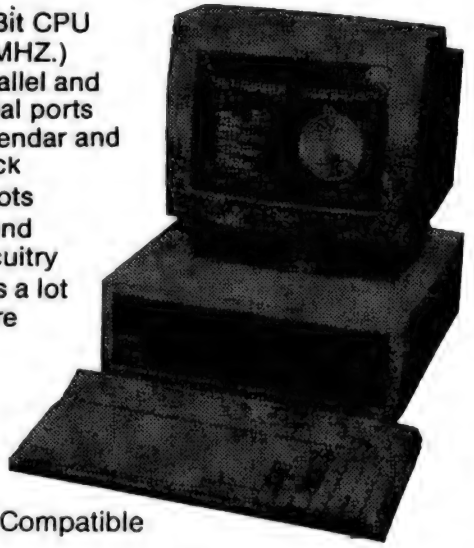

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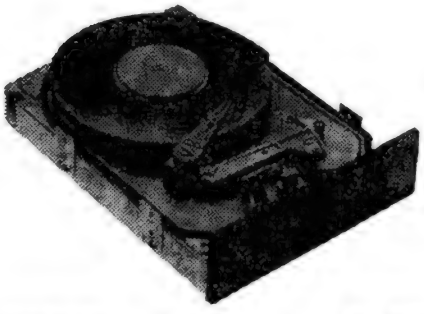

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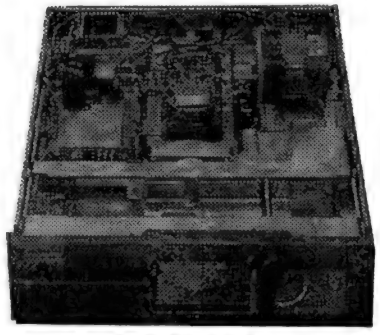

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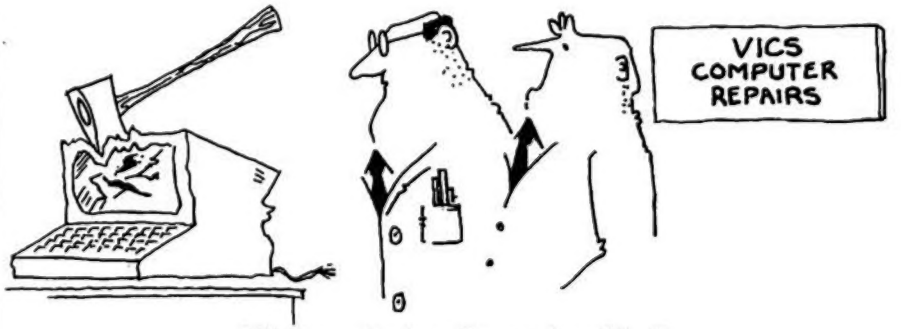

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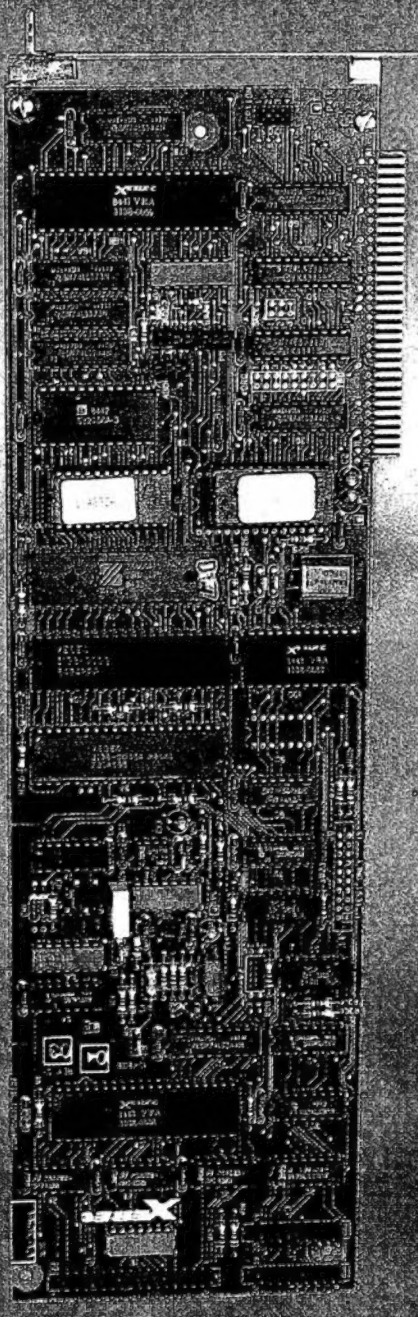

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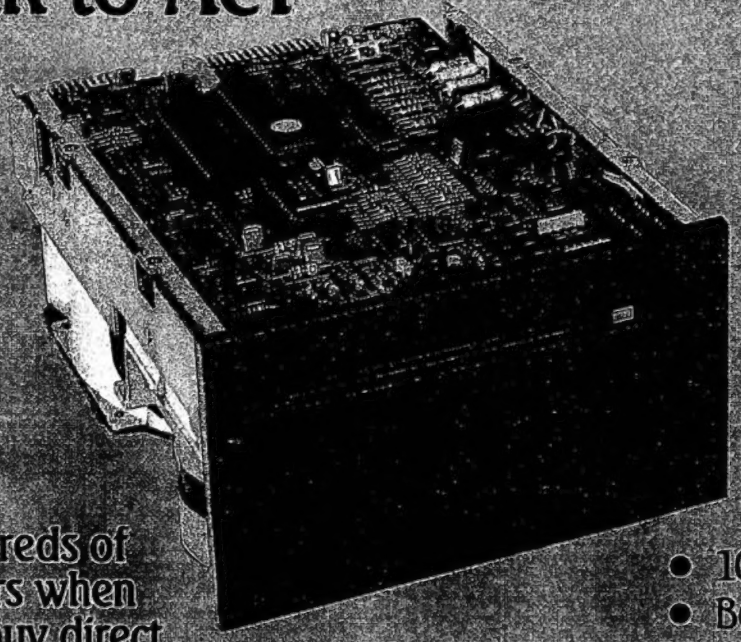

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